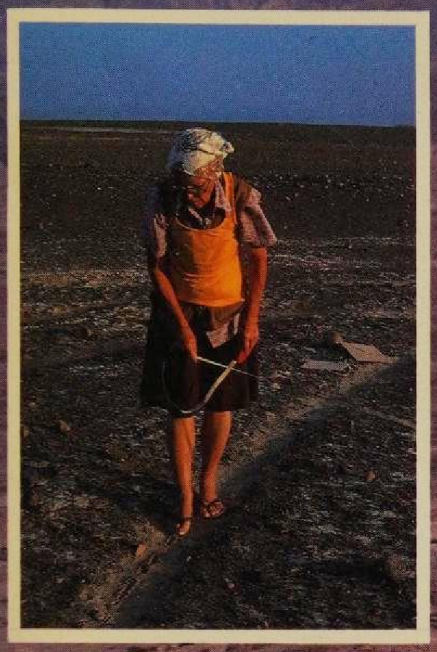

The Mystery of The Nasca Lines

Foreword by Maria Reiche

Tony Morrison

This is the only fully illustrated account of the forty-five years Maria Reiche has devoted to unravelling the mystery of the Nasca Lines. Maria was a student in Hamburg when extraordinary markings were discovered on a Peruvian desert. Her decision to leave her native Germany and travel to South America and her involvement with the curious lines which cross mile after mile of wilderness were not connected. Gradually, however, Maria's fate, and investigations into the lines, which are still one of the world's great enigmas, became inextricably mixed. One of the unique features of this book, which traces her life from its earliest days, is the careful revelation of the changes which have taken place in the desert since her arrival there in 1941. Clues to the mystery have disappeared or have been wiped away by the actions of men. Theories about ancient astronauts and other early peoples have been disproved or ended in uncertainty.

This book provides a superb historical and biographical account of Maria Reiche's story. Maria, herself, feels that predestination has played a vital part in her amazing involvement, which also drew in her sister, Renate, whose photographs of fifty years ago, never published before, show a pristine desert still untrammelled by man.

Above all, a life's work of patient investigation has brought Maria Reiche honours and worldwide acknowledgement as 'The Lady of the Lines'. For the first time her theories are presented against the background of controversy and conflict surrounding this fascinating subject.

ISBN 1 869901 061

200 black and white illustrations
50 colour illustrations

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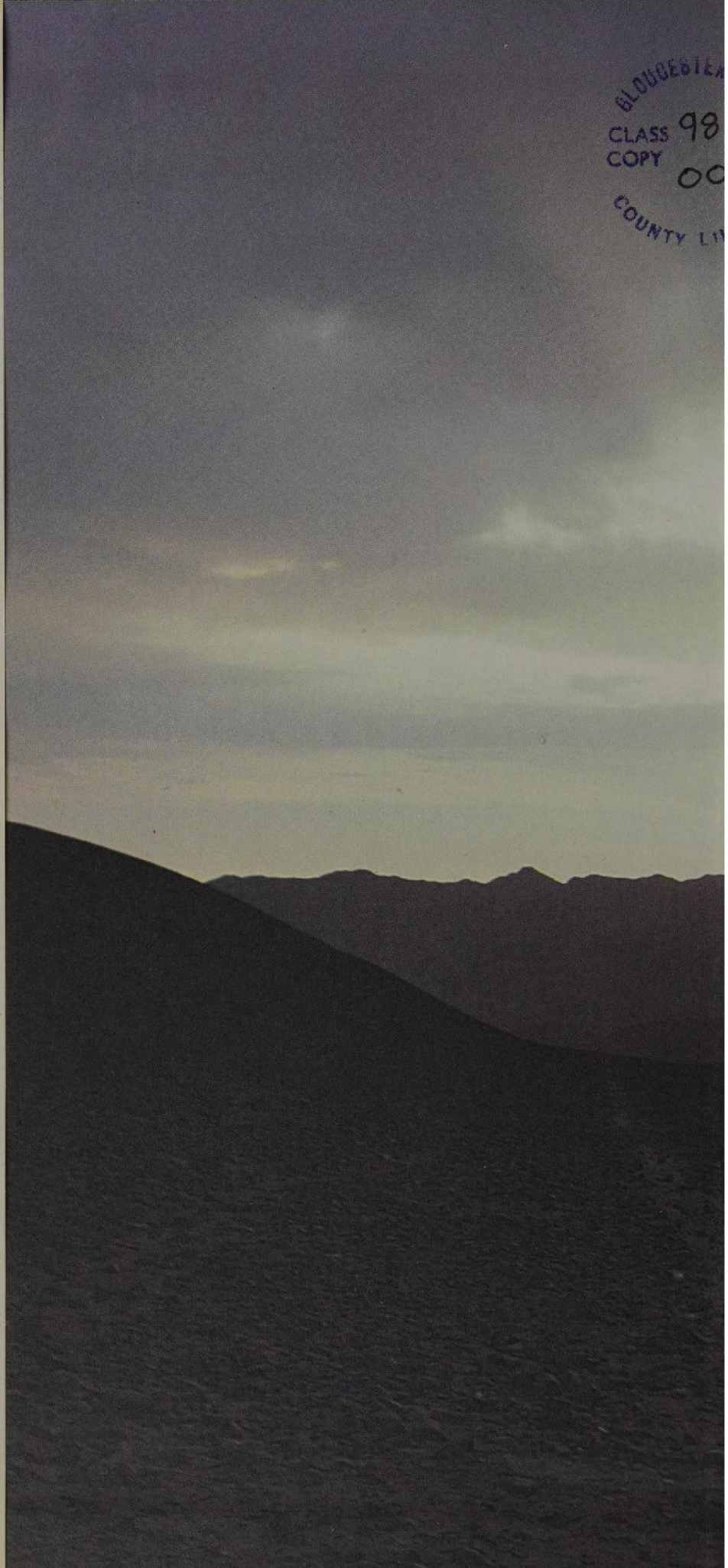

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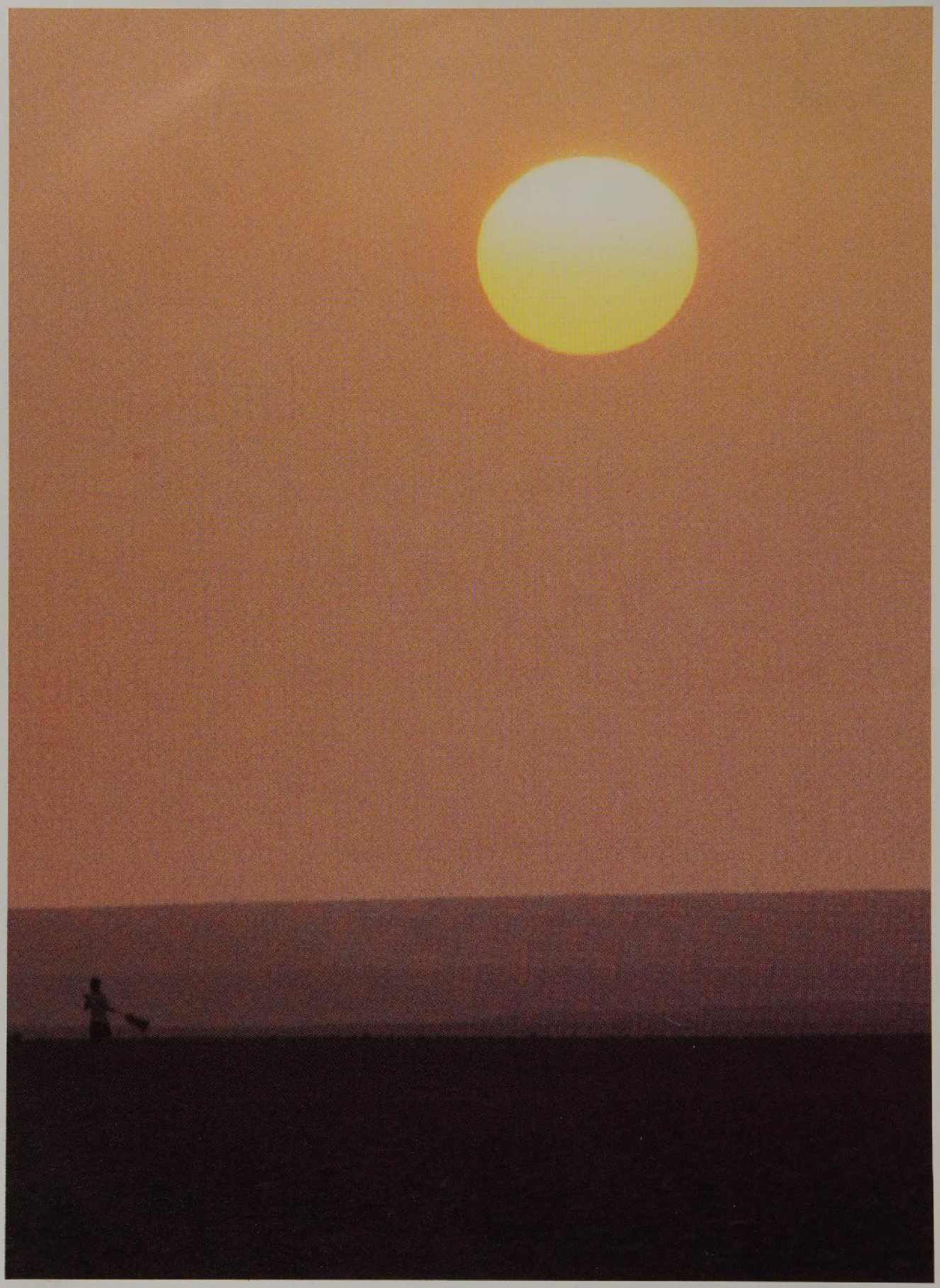
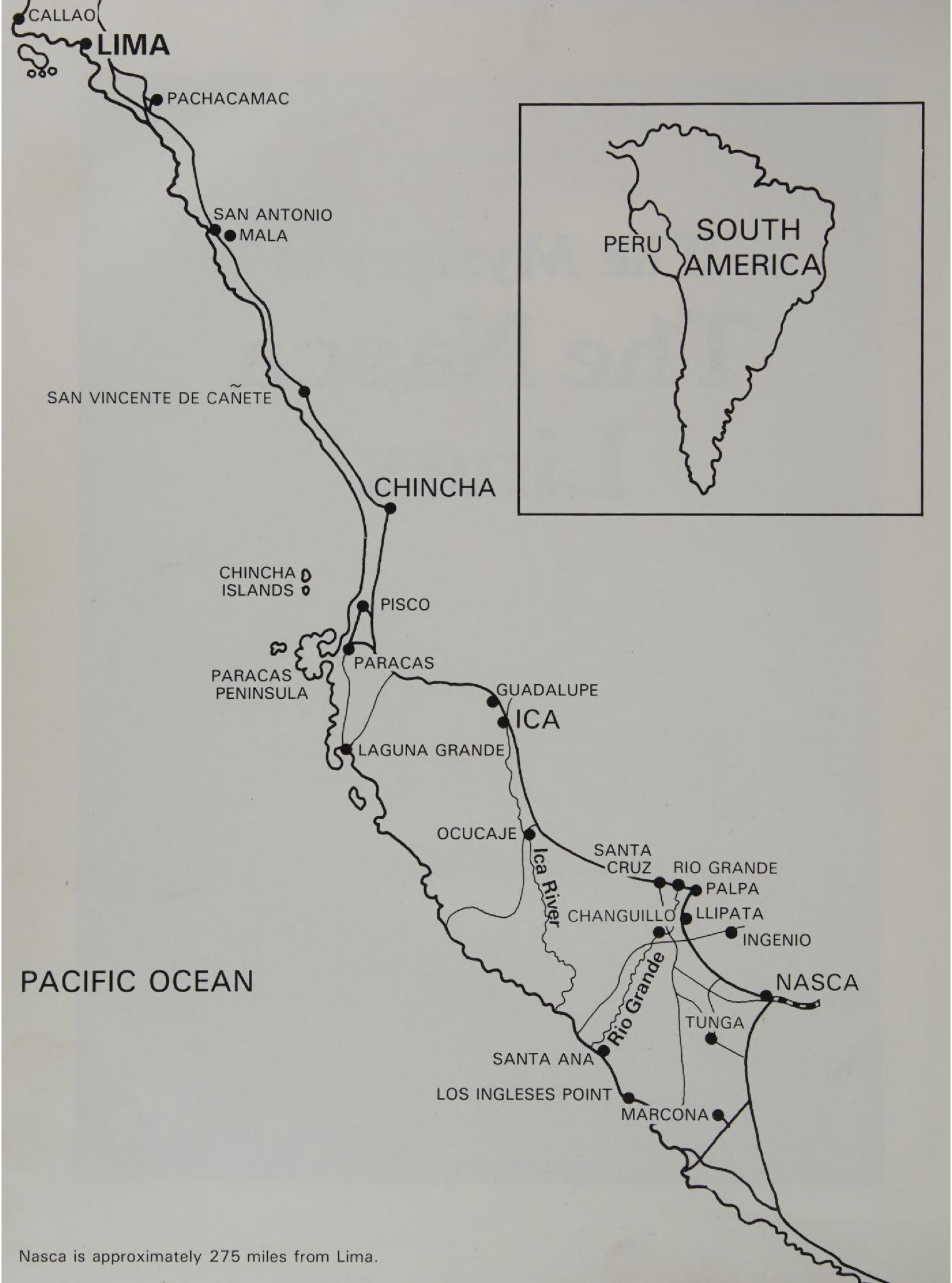


The Mystery of The Nasca Lines

Time plays tricks with the mind as surely as
light changes the face of a desert.
This story concerns both a fragment of
the Peruvian desert and the lifelong work of
a very remarkable lady, Maria Reiche.
Time also plays a vital role.
Possibly more important than at first sight.
Alongside time with its curious dimension,
the wilderness is marked
with patterns drawn by ancient man.
'It's a mystery on the desert',
Maria Reiche once said.
That was long ago and no one has yet
solved the mystery.



Nasca is approximately 275 miles from Lima.

The Mystery of The Nasca Lines

Tony Morrison

Foreword by Maria Reiche

Nonesuch Expeditions Ltd

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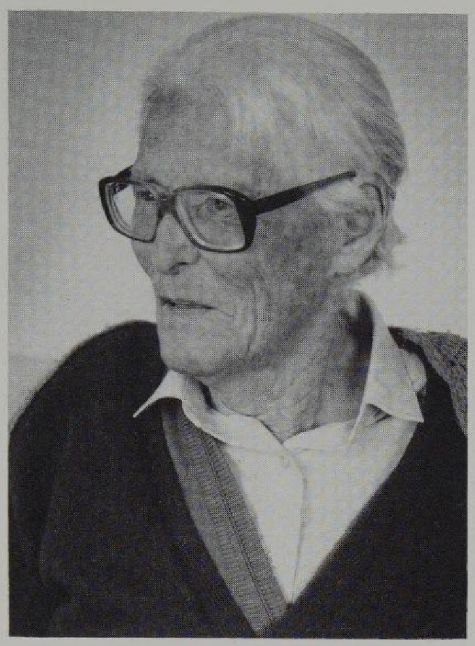


Foreword

For more than 40 years I have been privileged to live with this mystery. At times the experience has given me intense pleasure and at others it has left me downhearted with my efforts. But then everyone tells me that it is not unusual to feel such things, and I think you will agree with me that the Nasca lines are not so straightforward as they first appear. Many people have visited Nasca to see these remarkable features and I would like to thank everyone who has helped me. My thoughts go particularly to the enthusiastic support of the Peruvian National Air Photographic Service in Lima and my sister Renate.

Much still has to be done before the meaning of every marking is explained, and that will be impossible if the desert is harmed. The surface is too fragile to withstand any disturbance and already some places have been severely damaged. Since my first visits to Nasca I have called for protection for this historic desert. The people who lived here long ago left a unique document which I believe constitutes an essential chapter in the development of the human mind. There is nothing like it anywhere else in the world.

Maria Reiche
Nasca 1987

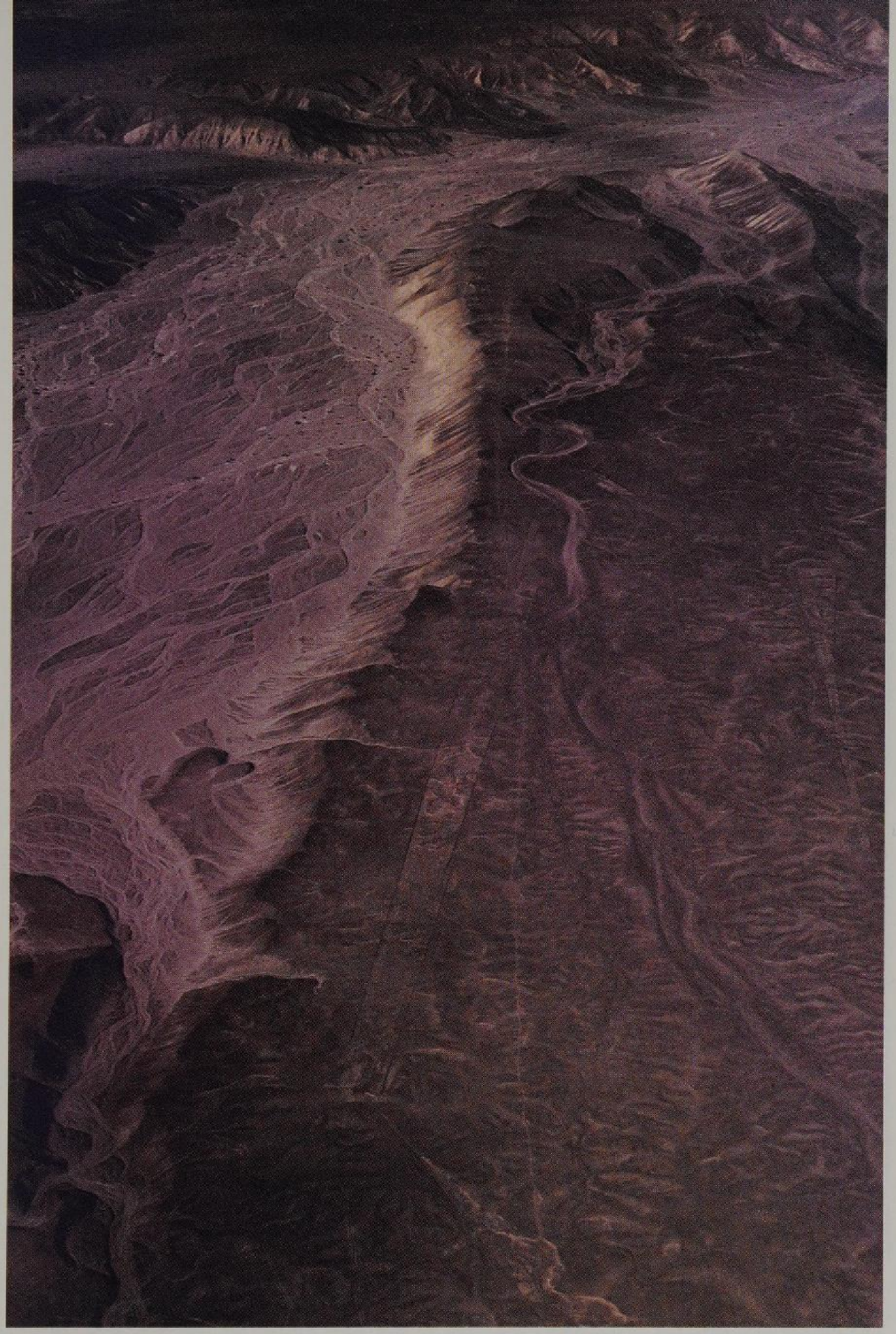
Publisher's Introduction

It is true to say that the Nasca lines are perhaps the greatest archaeological conundrum of the Americas. At some time in antiquity and without any apparent reason a desert was embellished with lines. Many of the markings run unerringly straight for mile after mile while others form zigzags or spirals. Sometimes a network of lines spreads out from a hill like the spokes of a giant wheel, but just as often others take the intricate shape of animals, plants and curious beings. Frequently the work is tiny and simply a few steps across. Conversely, some of the features are immense, taunting belief when seen from space with the naked eye.

These curious markings were found by archaeologists more than fifty years ago; yet, apart from the opinion of one of the discoverers who said they were sacred paths, the professionals have tended to shun the subject. Instead, the puzzle has been left in the hands of dedicated amateurs and a handful of academics with expertise ranging from astronomy to anthropology. Maria Reiche who left her native Germany in 1932 and who first visited the site in 1941, has watched many attempts to solve the mystery. All without success. In her opinion the answer *will* be found and it is simply a matter of drawing the clues together.

Maria Reiche, though outspoken about the often thoughtless destruction of the lines, is particularly modest about her own achievements. Her personal accounts of her tireless work on the desert are hard to find — many are written in letters she sent home to Germany or correspondents around the world. Thus few of Maria's memories and successes have ever been presented to a wide audience. A special acknowledgement is therefore given here by the author and publisher for the contributions in this book from Maria Reiche and her sister Renate. Photographs, diagrams and biographical details have been drawn from the archive kept in Germany by Renate who maintained an invaluable flow of correspondence with the author.

Immediately obvious from Maria Reiche's earliest reports are the clues she discovered soon after the Second World War, and which are very much in vogue today. It could be argued that once found Maria tended to overlook certain pointers. But not so; different detectives can use different methods to achieve the same result. Maria Reiche has always been convinced that in some way the lines hold information which was of supreme importance to their builders. If the idea that the lines are sacred paths is correct, then they could be likened to an ancient Inca record-keeping device which relied on knots on strings — rather in the fashion of knotting a tie to jog one's memory. Locating the key to the information stored in the markings and then deciphering it has been her lifework. Although her study remains unfinished, Maria Reiche is not



The Nasca desert, Peru.

despondent and remains open minded about fresh ideas.

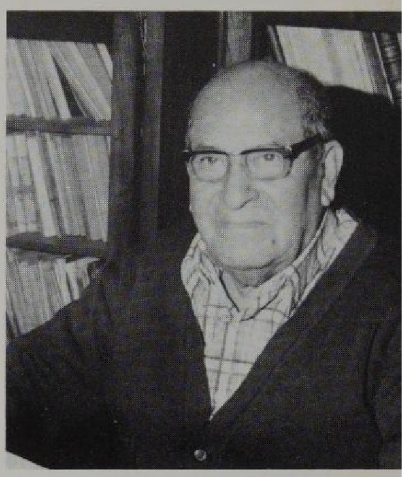
Significantly, the pace of investigation has increased in recent years but with relatively small strides ahead. One major problem is that the trail has grown cold during the many hundreds of years since the markings were made. To make matters worse the desert has suffered the onslaught of uncontrolled tourism and inevitably clues have been spoiled. As one ardent linesman admitted: 'A needle in a haystack would be easier to find — at least you know what a needle looks like'.

April 1987

The furrow-like markings of the Nasca lines can be seen from hilltops as they head straight across the desert. They were made by moving the dark surface rocks aside to reveal yellow earth. When fresh, these lines shone vividly in the harsh landscape.

CHAPTER 1

A Desert Mystery



A Peruvian, Toribio Mejía, was one of the discoverers of the Nasca Lines.

For the sleepy town of Nasca, September 1926 was to become a benchmark in its history. The low stuccoed walls of houses lining the streets reflect a baking sun for much of the year. Dust perfumed with the unmistakable smell of crops and farm animals lends distance: Lima, the capital, is seven hours by road to the north. Though Nasca itself is rather surprisingly nestled among the cotton plants and palm trees of a fertile valley in the foothills of the Andes mountains, the desert is never far away. Sand dunes almost a mile high rise behind the town and one, called locally the Cerro Blanco or White Hill, is believed to be the highest on earth.

The Nasca valley has been inhabited for over two thousand years and traces of the ancient people can be found everywhere. Beside the Pacific Ocean just fifty miles to the west, immense heaps of shells stand as a testament to rich harvests gathered by a long-forgotten fisherfolk. Close to Nasca the remains of pyramids, built from tens of thousands of mud bricks, are surrounded by a similarly indefinite number of graves. Over the years most of them have been opened and looted, but in 1926 there was much to find. So late one afternoon two archaeologists set out to climb a hill behind their camp near the cemetery at La Calera along the road south.

The hill stands close to the valley edge, about thirty minutes of dusty walking from the centre of town. Alfred Kroeber, an American, and Toribio Mejía, a rising Peruvian scholar, scrambled across rocky slopes to find a lookout. The explorers needed to take advantage of the low angled sunlight just before dusk which gives form to even the subtlest features. Tumbledown remnants of dwellings, fortifications or ancient roads stand out clearly from the desert surface in such conditions and Kroeber and Mejía anticipated new discoveries. As they gazed down from the hilltop they saw curious furrows, or long, straight depressions in the stony 'pampa' or level desert.

Which of the two men first made the discovery may never be known and it has gone down in Nasca history with the same sort of question as 'Who stood first on the summit of Everest — Hillary or Tenzing?' In the case of the Nasca

Finely constructed shafts lead to the puquio *tunnels.*

'lines', both Kroeber and Mejía made notes of their impressions. Kroeber put his comments in one of his field diaries for 1926, which he discussed with the great American scholar, Professor John Rowe. In response to Rowe's question about his Nasca records, Kroeber said 'My excavation notes are not very good'. John Rowe later added 'They weren't, but I saw his drawing of the lines'.

Mejía also made notes which eventually were published some fourteen years later. Both impressions were almost casual, and neither Kroeber nor Mejía attached great significance to the markings which they assumed were unprepossessing attempts to build irrigation channels. At the time of the discovery of the desert markings or 'lines', Mejía's interests lay more with the unusual subterranean water channels or *puquios*. These man-made tunnels, running for long distances below the valley, resemble the *qanats* of Iranian deserts and surprisingly are unknown in other parts of Peru. Gravity wells, as these tunnels are known, were built to tap the phreatic or ground water below the watertable, so were a relatively sophisticated development.

The alternative, and much more common, are simple surface channels, which in Peru are as much part of the desert scene as thorn bushes and dunes. No wonder that the lines at La Calera were not immediately exciting to Kroeber and Mejía. There the matter could have rested had it not been for the lasting and exceptional devotion of Maria Reiche.

Maria Reiche was born in May 1903 in the historic city of Dresden, the German centre of art and culture known as the 'Florence of the Elbe'. Maria's father, Max Felix, was a judge and her mother Elizabeth, or Elli as she was fondly called, had studied in both Hamburg and Edinburgh. In 1906 Maria's younger sister Renate was born, and three years later their brother Franz.

The Reiche home was a fine house in the old city, with vines and flowers filling the garden, but life for the three young children was strict, even cold at times. As Maria grew, however, she came to understand her father. They would walk together, often silently, in the woods of Saxony, each with their thoughts. She could have been set for a pampered life surrounded with the trappings of a classical education. She was eight in 1911 when the first performance of Richard Strauss's *Der Rosenkavalier* was given in Dresden, and the family thrived on music and the theatre, indeed Shakespeare remains one of Maria's greatest pleasures. She also mastered English and French which she still speaks with easy fluency.

Looking back to her formative years of family and student days, Maria once said that her spirit of adventure must have been touched with a personal rebellion. Behind all her successes her sister Renate made the running. Renate excelled at sports and pushed Maria to try harder, and it was Renate who persuaded her to accept with resolve the myopia which has dominated her life. But above all Maria's determined inquisitiveness began to surface: she was a dedicated mathematician and thrived on problems of logic.

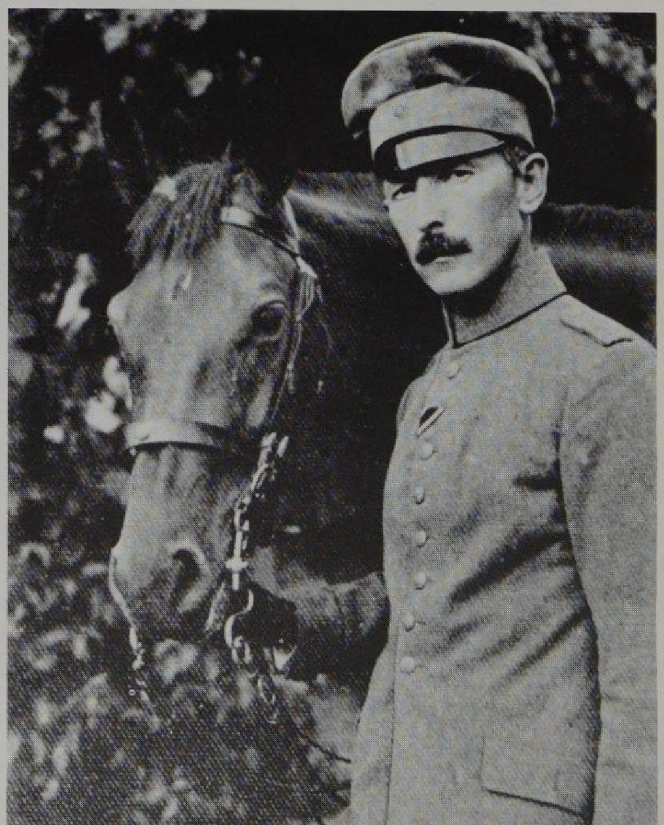
Maria Reiche was born in Dresden on 15 May, 1903.

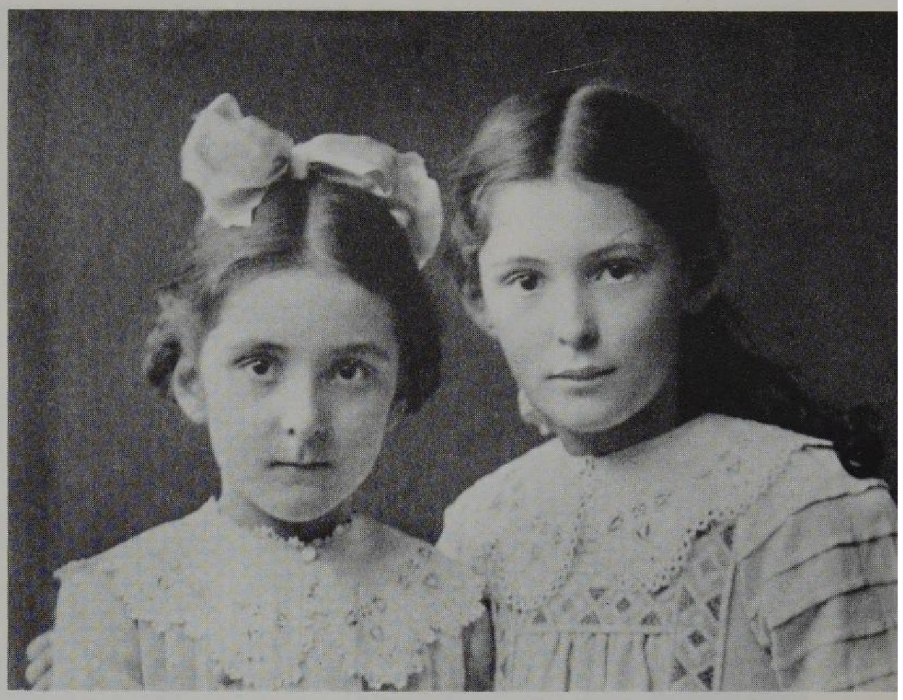
Maria was six when brother Franz was born; he died before he was thirty.

Above, Elli Reiche, Maria's mother studied in Hamburg and briefly in Edinburgh, Scotland, two years before Maria was born.

Below left, allied bombing in World War II devasted much of Dresden. This house, once the Reiche home, survived.

Below right, Max Felix Reiche was a Saxony judge who died in the Battle of the Somme in July 1916. The Great War became a turning point for the Reiche family who, like many thousands more, faced an uncertain future.





Above, sophistication for Maria was short lived and eventually she turned her back on home life.

Above right, Maria and her sister Renate when the Great War burst on Europe. They were in Dresden and already very close.

When in 1926 the Nasca lines were first discovered, Maria Reiche was twenty-three and a student of mathematics at Hamburg University. Like many of her friends she was aware of the political maelstrom enveloping post-war Germany where Adolf Hitler had just published *Mein Kampf*. Maria, on remembering these times, insists she was not a political animal. 'In fact I felt disgusted at the thought of all the hatred being generated and I wanted to distance myself'. Yet like so many young people of the day, perhaps out of curiosity, Maria found herself drawn into discussions and noisy student meetings. Being athletic, enjoying swimming, diving and other sports, in the eyes of some she could be seen as the archetypal Hitler Youth. But while the National Socialists swept forward in the polls, eventually commanding six and a half million votes in 1932, Maria became all the more determined to leave her country.

It was her love of children which drew her attention to an advertisement in a Hamburg newspaper which offered the post of governess in the home of the German Consul in Cuzco, a Peruvian mountain city, once the fine Inca capital. Her application was accepted and without a second thought she set out alone on a five week sea journey to the southern Peruvian port of Mollendo.

Maria has always insisted she was not fleeing the attentions of some student Romeo, though she has often remarked on her thoughts of marriage in those early days, saying how she felt love many times but 'I never considered marrying a German; for me I wanted to make a one hundred per cent successful marriage if I made one at all'. Her instinct was leading her and she has never had any regrets.

Maria studied in Dresden, Hamburg and Leipzig becoming a talented mathematician and schoolteacher.

In the 1930s Cuzco, the ancient Inca capital, was isolated from the rest of Peru.

An album picture from 1932. Maria in the cactus studded countryside near Cuzco.

Part of Maria's interest in South America was her budding enthusiasm for astronomy and she knew the work of the German astronomer Rolf Müller. In 1929 he published in Potsdam details of how certain Inca buildings in Cuzco had been built to face the rising sun at the important June solstice of the Inca calendar. The sun on this mid-winter day shone on a golden shrine in the Coricancha or sun temple, the most sacred in all the Inca Empire. She also knew that the Incas held a special festival, the 'Inti raymi', in honour of the sun: it was a time of special dances when sacrifices were offered on the principal hills.

Much of this rich symbolism was still surviving when Maria reached South America so there was more than enough to see and learn to keep her interest buoyed up. Her thoughts were never more positive than during the long train journey she made across the mountains from Mollendo to Cuzco. The track climbs from the sea through a gaunt landscape of burnished rock bearing hardly a scrap of life. Breaks in sterility come only when the train winds into deep valleys lying at the foot of gigantic volcanoes, beyond which it climbs tortuously to fifteen thousand feet high passes, hot springs and snow-capped peaks.

Maria has always said that she believes her days in Peru were predestined. 'It is difficult to explain but you know when it happens. For me, Cuzco was simply the first step'. She once enlarged on her idea, saying how Cuzco and all Peru had greeted her like 'a quadruple rainbow'; she never felt homesick for Germany except on her infrequent return visits.

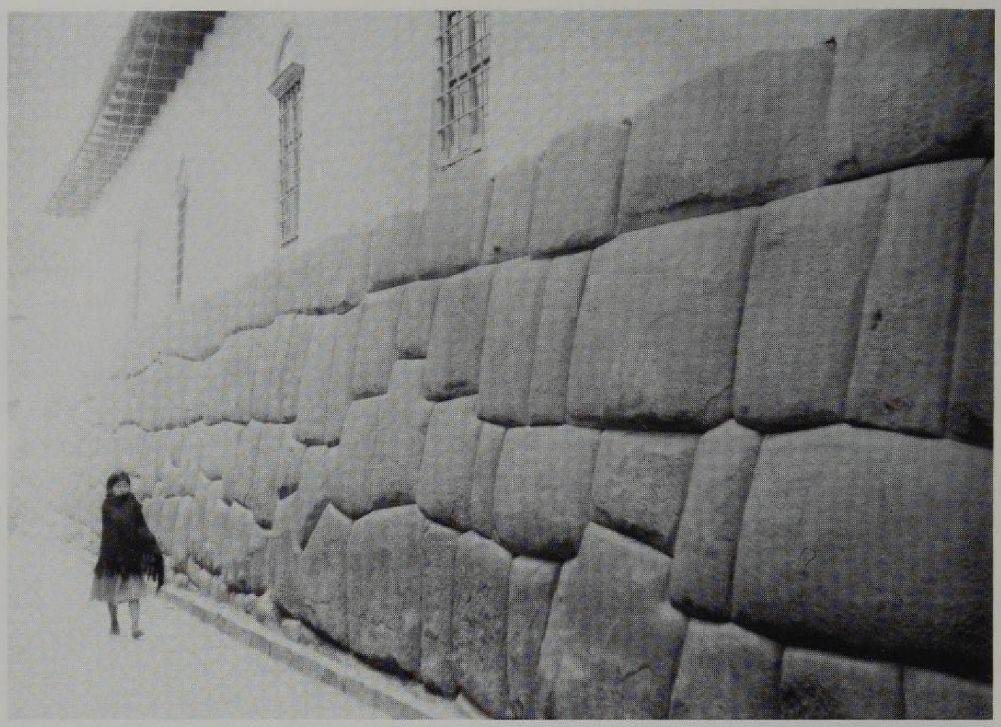
She settled quickly into her new life, caring for seven year old Erhard and the delightful four year old Hilda, the children of Herr Tabel and his wife. Herr Tabel, besides being the German Consul, was also, perhaps not surprisingly, director of the Cuzco brewery.

Although the Inca foundation of Cuzco dates from AD 1200, at which time many of Europe's cathedrals were already old, the open squares and narrow streets possess the qualities of a time capsule. All the sights, sounds and smells of this city transport a visitor back into the Middle Ages in reasonable comfort. Spanish colonial or younger buildings are supported on foundations of fine Inca stonework. Quechua Indians, the descendants of Inca dominated families, plod narrow streets bent as if genetically crushed by Spanish conquerors, though more probably by a legacy of heavy burdens.

Maria Reiche looked on this scene and was fascinated by the customs of people who are at times barely a few steps removed from their ancestry. But as a governess she had little time to pursue her personal ambitions. Fortunately, the thing she enjoyed most of all in her work were long walks or outings in the children's company. They were taken by Herr Tabel's chauffeur to places in the mountains like Tambo Machay, the remains of an Inca hunting lodge. There, amongst springs and fountains built by the Inca Yupanqui, Maria and the children set out their picnic on a hillside carpeted with tiny

Quechua Indians bear a weighty platform carrying a saint in the festival of Corpus Christi.

One of Cuzco's mule drawn trams passes the Bank of Peru and London, one of the country's earliest banking services.



Much of Inca Cuzco remains intact with Spanish buildings set on the ancient walls.

yellow flowers, relatives of the European daisy.

Of the many facets of the new world around her, Maria began to understand the ways of the Indians and their belief in ancient gods. The Spanish invaders had stamped on the old customs and tried, though not always successfully, to superimpose a catholicism which was seen by Maria through the eyes of the strictly conventional Cuzco families. Exceptions were common as she discovered once she had found where to look. Particularly fascinating to Maria, who already kept to a strictly frugal diet, was the Indian reliance on herb medicines and a curious mixture of 'magic' and natural substances used for healing. She learnt, too, of the Indians' understanding of spirits and omens — both good and evil. Everything she had been accustomed to had little relevance in the Indian world around her. At times her life could have been a fantasy, beyond normal appreciation.

Maria revelled in the outdoor life.

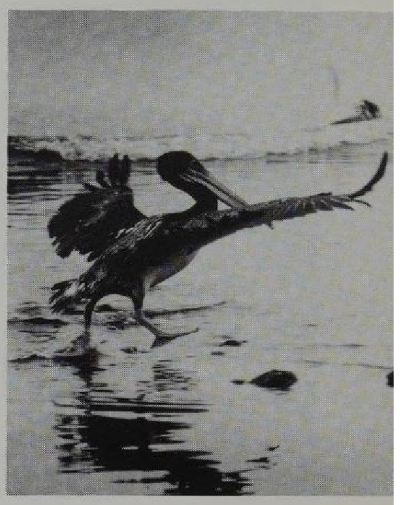
It was after one of her jaunts into the Andean countryside that Maria found a splinter deep under the nail of a finger on her left hand. A severe infection followed and at the insistence of her employer she braved a Cuzco hospital and surgery for the removal of the tip of the finger. One of her old friends later remembered how Maria described the remarkable vision she experienced while under the anaesthetic. Apparently during the operation she seemed to leave her own body and, floating out of the window, had seen 'all of Cuzco spread out below'. As she came out of the anaesthetic she realised she was returning to her own body.

But her job was not to last. Maria and the Tabels never saw eye to eye. Although the children were her joy and she loved them dearly, when eventually they distanced themselves from their parents her contract was quickly terminated. The year was 1934 and she found herself bundled on a train with her luggage bound once again for Mollendo, where her ex-employer ensured

she boarded a ship bound for Lima and Germany. Maria, however, was determined to stay in Peru.

When the ship berthed at Callao, the port for Lima, she was told her papers were not in order and was refused permission to go ashore. Here again, Maria believes that predestination played a part: during the voyage she had made friends with a lady who not only had the right connections but also tempted her to open a kindergarten in Peru. Maria accepted the challenge and immediately all the formalities were waived.

She spent much of the next few months in Ancón, a small coastal resort surrounded by desert and about twenty-five miles north of Lima. It was a pretty town of palms and large avenues of South American pine trees and Maria spent much of her time wandering amongst the desert hills where 'There is nothing but sand, nothing alive, no plants, no birds, no sound — nothing but an immense silence and solitude. It gives you quite a peculiar feeling'.



Brown pelicans enjoyed the richness of the Peruvian coast.

Ancón, a favourite resort with Lima society, was connected to the capital by railway which was always busy at weekends. Its climate, as Maria remembers, is somewhat drier than that of Lima, which in winter suffers heavy mist, or drizzle which the locals call 'garúa', and she noticed how many seabirds fed on the richness of the cold Peruvian current which itself influences the climate and helps create the extraordinary desert. 'And the quantity of waterfowl! The pelicans are rather confident and come near the shore. By swimming one can get quite near to them'. She noticed how the pelicans 'do not dive like ducks. . . they have to rise a little bit out of the water and then, drawn by the weight of their heavy beaks, dip into the water like stones. With so many birds, it is a continual rising and falling and a very animated play as they move about near the shore'.

The kindergarten started and almost as quickly closed, and once again Maria found herself without a job or permission to stay in Peru. She freelanced for a short while and then, in 1936, returned to Germany to stay with her mother in Hamburg.

The visit was short. Maria lectured briefly on her travels at the Völkerkunde Museum, and then at a clinic in Halle, where Renate her sister was working. By 1937, less than a year since leaving Peru, Maria was once more on a ship bound for South America and Lima.

'Here I am, once more back in Gamarra Street'. Maria was living in a small rented apartment close to the centre of the city and giving lessons in mathematics and gymnastics three times a week at the English school. Once more she found that she developed a strong rapport with the children and this time it ensured her job. As she made friends in the pre-war Lima, Maria found herself drawn more and more into intellectual and cultural circles. By 1938 she was working in the National Museum, translating German scientific and technical journals. Another part of her work was the supervision of the

A statue of Francisco Pizarro was placed in front of Lima Cathedral in 1935. Pizarro reputedly laid the first stone there four centuries earlier.

restoration and repair of the beautiful cloths which wrapped the bodies of ancient Peruvians buried some two thousand years ago. These mummy wrappings are among the most exquisite works of art to have survived from pre-Columbian America, some of the most famous having been discovered in simple tombs beneath the sands of Paracas, a desert peninsular roughly half way between Lima and Nasca.

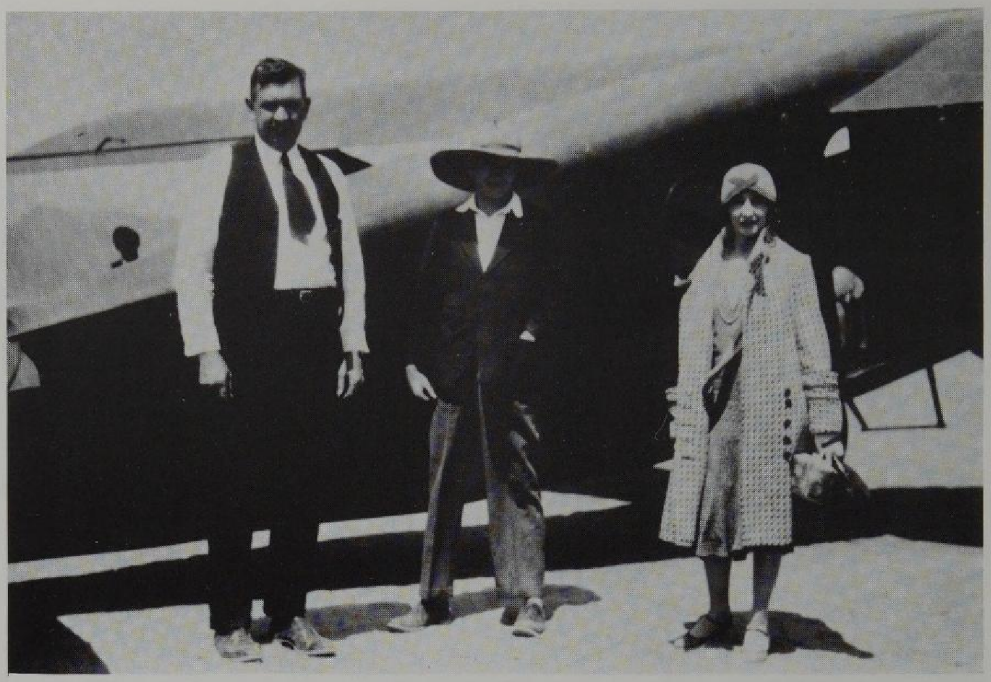
The Paracas site was excavated by the Peruvian master of archaeology Julio C Tello and Toribio Mejía, Tello's principal collaborator when the work began in 1925. Two forms of burial were discovered and one, at Paracas-

Trams connected central Lima with many suburbs.

Necropolis which was found by Mejía in 1927, revealed 429 mummy bundles. The naked body was seated in a wicker basket and swathed in fine cloths. Between the layers of cloth, the decorated ponchos and shawls, the mummy was packed with all manner of goods for the spirit to take to the afterworld. Ornaments of gold, pottery, weapons, food and even pet animals were found with the 'fardos', as the bundles are called. Some of the largest were almost five feet high and took two men to lift them.

The excavations continued until 1930, during which time Tello and Mejía discovered that some of the perfectly preserved mummies were wrapped in embroidered cloths of unrivalled quality. Some of the wrappings made from hand-spun wild cotton were as much as thirteen feet wide and up to eighty-four feet long. The embroidered designs in cotton coloured with natural dyes have the form of magico-religious characters, feline demons, warriors carrying trophy heads and an assortment of deities still being renamed and classified. Such was the scale of the 'find' at Paracas that, even now, many of the smaller bundles have remained unopened in the storerooms of Peruvian museums.

Fine embroidered cloths wrapped the Paracas bodies.



Elmer J 'Slim' Faucett, a pioneering American, founded an airline to conquer the Andes mountains.

Others, it seems, have just simply disappeared; not an uncommon occurrence in the world of high value ancient art.

Maria's work for Tello provided her with a small income and valuable experience which, even at the beginning of her new life, she is remembered as saying was 'enormously interesting'. Though Nasca and its strange markings had yet to make its mark on her, the mystery that eventually took over her life was getting closer. At this time archaeologists were beginning to compare the Paracas-Necropolis designs with those found in burial grounds at Nasca and the intervening valley of Ica. Then, in the 1930s, flights across the desert became commonplace and pilots started to report lines from other parts.

One pioneer airline started by a lanky American, Elmer J 'Slim' Faucett, had stopping places on its route southward to Arequipa. The aircraft included specially adapted machines known in Peru as 'Stinson-Faucetts' and these had the capability of taking on some of the highest mountain passes. Stinson pilots on the Arequipa journey had to reach over 9,000 feet and almost 4,000 between Ica and Nasca. Looking down to rugged Andean foothills, pilots passed over the range of Santa Cruz, now pierced by a road tunnel, before they saw the first markings on the greyish-red desert near Palpa.

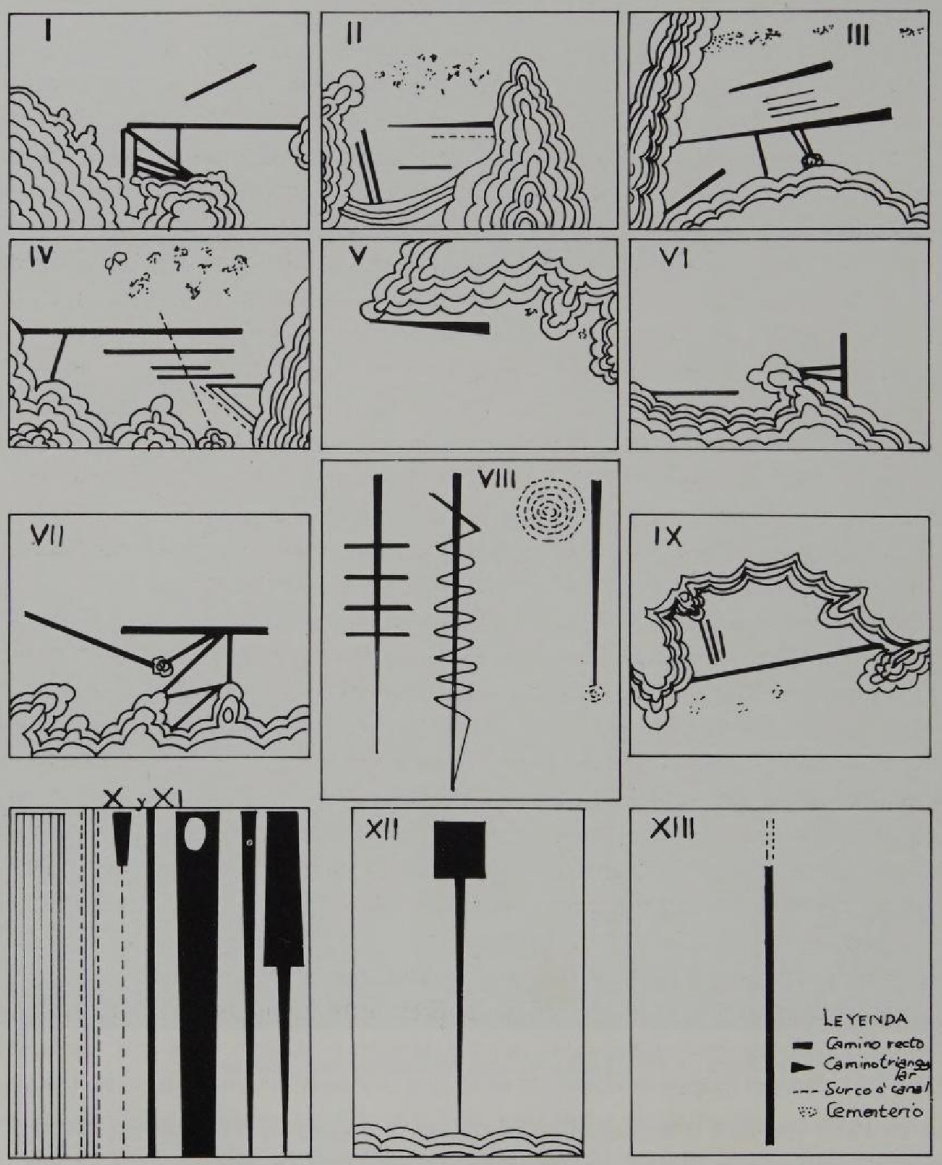
One of the earliest aerial photographs of the Nasca markings was taken in 1939 from a Faucett aircraft.

Each spur of the mountains is embellished with a long thin triangular clearing. In the early days these clearings and the lines leading to them were the most noticeable features. But as pilots flew from Palpa southward to Nasca, a distance of about forty miles, they realised that the desert was covered with all manner of geometric shapes. As the first aerial photographs were taken slowly the lines became known. The British ethnographer and archaeologist, Geoffrey Bushnell, flew over the lines in 1939 and fifteen years later, as Curator of the Cambridge University Museum of Archaeology and Ethnology, he said 'Whatever the explanation, the setting out and execution of these perfectly straight lines and other figures must have required a great deal of skill and not a little disciplined labour'.

Early flying along the desert of Peru produced some fascinating new impressions.

But in 1939 the fact was that the lines were a curiosity. Though the shapes and straight lines were being classified by Toribio Mejía, urged on by Tello, they were very much an afterthought to his work on the irrigation *puquios*. Mejía had made a special trip to Nasca to draw some of the lines and planned to announce his work on both projects at an International Congress in Lima to which experts from all over the world had been invited.

While Maria was working with Tello he had introduced her to many archaeologists who were preparing their work for the Congress. She delved deeply into the understanding of ancient Peru and developed a liking for the ways of the Peruvians. Friends who remember her during those days say they had no doubts about her desire or her ambition to stay and research. 'The Peruvian earth has put its spell on me', she said at the time.



Courtesy Toribio Mejía and National Library, Lima

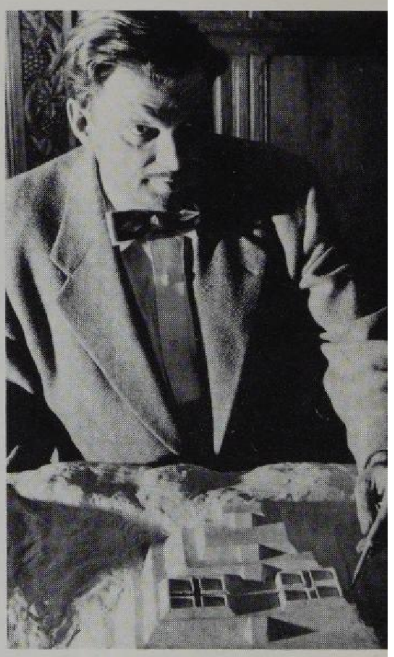
Toribio Mejía spent some weeks at Nasca, and made the first clear drawings of the markings. His work revealed zigzags, spirals, large clearings and many long, straight lines. Mejía referred to some places as cemeteries, and assumed all the lines to be sacred paths or ceques *as they were known in Inca times.*

As the date of the Congress approached Maria happened to make friends with Amy Meredith, an English lady some twelve years older. Amy, who owned a small teashop in the centre of the city, had both charm and a bubbly personality. Her reputation among the foreign community for generosity set her apart. 'She was a typical English rose', a long time resident once said, 'and she had a strong, serious social awareness which at the time seemed quite unusual'. Peru in the 1930s was a country of rich landowners and a large Indian labour force, and Amy's social conscience could not fail to be noticed when, as her business developed, she introduced a system of profit sharing among the employees, giving them each a monthly dividend.

Maria and Amy became great companions, spending much time together and always enlarging their circle of friends. Amy gave famous tea parties, sometimes with as many as forty guests who, in the social style of the day, stood in groups to drink tea and eat light biscuits. This kind of entertaining was very much suited to Maria's own frugal style and her friendship with Amy grew to be long and lasting. They travelled together on camping excursions near Lima, sometimes returning to the sea which Maria always enjoyed.

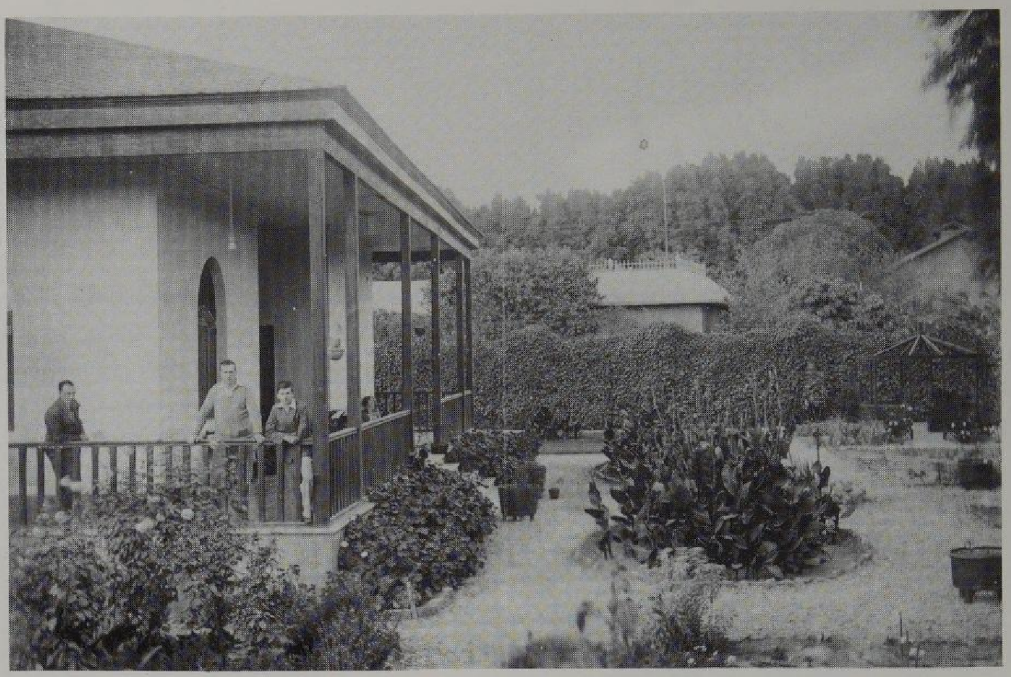
Often Maria helped Amy in her teashop, which had become a well-known gathering place for transient foreigners, for the teashop, in a narrow open walk or *pasaje* near the Plaza de Armas, the main square, was well placed to catch travellers, sightseers and shoppers. The neo-Baroque Presidential Palace built in 1938 was within sight of the door and the Desamparados railway station for the highest line in the world was five minutes walk away. Across the plaza to the right stood the cathedral with the 464 year old remains of Francisco Pizarro, the conqueror of Peru, lying shrivelled and dry as husk in a glass casket. Any traveller, even those in town for the day from visiting ships berthed in Callao, was bound to find Amy's shop, so it was no surprise to find among the customers those academics who had stayed after the Congress.

Paul Kosok, a well-built native New Yorker from Long Island University, was just one of many who called at the teashop where his enthusiasm caught the attention of Maria and Amy. The ebullient Kosok was a man of many talents. He excelled at history, he dabbled expertly in archaeology, he was a talented musician and conductor — so much so that his real métier should have been music. One of his colleagues remembers him as a 'great eccentric who thrived on work'. Twice married, Kosok travelled to Peru in 1939 with his second wife Rose Wyler. He had joined Long Island University ten years earlier as an instructor specialising in history. The trip to Peru was intentionally brief; more of a preliminary survey of the ground he intended to cover in a proposed study of early irrigation methods. Kosok then returned to the United States to present his work to a congress in Washington in 1940. Later the same year he took a year's leave of absence from the university and returned to Peru with Rose.



Paul Kosok was a 'man of many talents.'

Most of his work was focused north of Lima where the remains of pyramids,



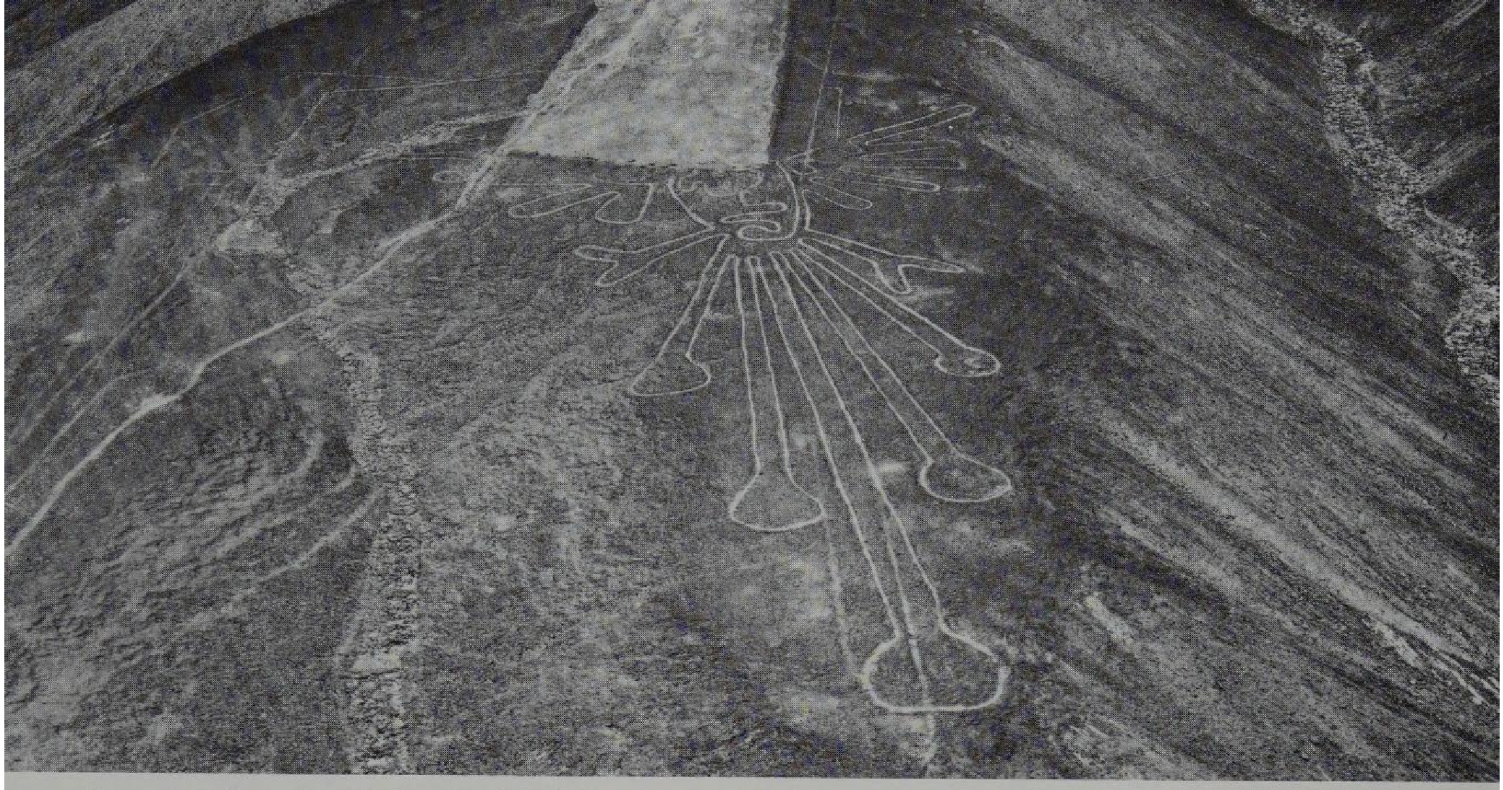
The Masson family lived in the company house of Alexander Eccles & Co, a Scottish firm working cotton oil in Ica.

fortresses, canals and settlements rest incongruously among sprawling fields of sugar cane. But Lima offered museums and libraries and Maria Reiche found herself once more employed as a translator, this time for Kosok. It was early in 1941 that he decided to travel to Nasca. Toribio Mejía's account of the lines and the possibility that they were connected with irrigation was sufficient to persuade him. He arrived with Rose on the Nasca desert in June.

For reasons which are not clear Kosok decided to work on the desert pampas a few miles to the south of Palpa. Possibly the very obvious cleared areas at Palpa were an attraction, or it could have been because of the reports of truck drivers who knew of some extremely long lines not far from the settlement of Llipata, a stop along the way south. One traveller who knew this place from as far back as 1929 was Duncan Masson, a young Scot who was working on the nearby farm of Las Mercedes. Masson had passed through the desert, crossing the lines, and some years before he died he recalled the experience: 'As we drove over the pampa we saw these furrows to the left and right of the track. They were obvious. . .you couldn't miss them. We thought they were old roads'. It was to this place that Kosok headed first and, sure enough, to the left of the road he found a perfectly straight line leading to a hill almost two miles away. On the other side of the road the line continued across the desert to the foot of another range.

Duncan Masson, a young Scot, worked on a farm a few miles from Nasca in the 1930s. Before his death in 1984 he talked of driving across the desert lines in his specially adapted Model T Ford.

Paul Kosok turned to the first hill and found that it was the centre of a complex of lines. Some narrow, others more than ten feet wide. Some



This curious figure, found by Paul Kosok in 1941, adorns a hilltop between Palpa and Nasca. The clearing is approximately 80 feet wide at its broadest part.

lines led to the crest of the hill, their form being clear as shallow U-shaped trenches. At the top, overlooking the desert, Kosok found piles of stones at the ends of the lines and a large area cleared of surface stones. The clearing followed the form of the hill though with a clearly defined trapezoid outline.

The conditions on the desert were not good. Kosok and his wife had to carry everything they needed for the day's work, including drinking water. But as they traced the form of the trapezoid they realised that one end was embellished with a complex design of scrolls and finger-like projections. The pattern was scraped in the ground, though to a lesser depth than the main shape of the clearing. This was the first of the designs to be discovered, and describing it Kosok could offer no explanation: 'What it portrays we do not know'.

It was on the same visit that Kosok noticed the sun setting almost directly at the end of a line and understandably he was 'Struck with the thought that the remains could have had some astronomical or calendrical connections'. These ideas were uppermost in his mind as he headed back to Lima and Amy's teashop.

Once more among interested friends he talked over his discoveries and ideas with Maria Reiche who was enthralled. Here was her subject: mathematics, with astronomy, time, calendars and her new interest in archaeology all rolled into one. Kosok offered some small funds to Maria if she would continue the investigation after his return to the United States. She agreed. 'Once more I knew it was my predestination at work'.

The next step involved more observations of the sun and Maria and Paul Kosok decided that she had to go to Nasca and see that year's December solstice, the time when the setting and rising sun reaches its extreme position on the north-south journey along the horizon. All the evidence up to that moment pointed, according to Kosok, to the lines being an ancient calendar. 'It was', he said, 'the largest astronomy book in the world.'

Hilltop markings above the Rio Grande are out of sight to travellers on the road to Nasca.

Nasca in the 1940s, with its cobbled streets, nestles in foothills of the Andes.

CHAPTER 2

The Largest Astronomy Book

Europe was at war. In December 1941 the Japanese attacked Pearl Harbour and overnight the Pacific became another arena. But in Lima daily life hardly changed. Peru even prospered.

Maria Reiche was thirty-nine when, late in 1941, she set out by bus for Nasca. 'The gods had ordained my journey and the course of my work' she has said many times, but she has never admitted the problems of those early days. In the 1940s the bus could take as long as twelve hours to cover the 275 miles. Generally the service was reliable enough, though with frequent stops and moments of concern for the survival of machine and passengers. The crosses and shrines left along the way punctuate a saga of calamities. From Ica southward the road taken by Maria crossed a broad, waterless desert where a camel caravan would have completed the scene: the Spanish conquerors of Peru had introduced camels from the Canary Islands but the conditions were unsuitable and the last died in 1615.

Once across the desert the old road climbed the desolate Santa Cruz range before descending abruptly to the broad Rio Grande, which takes the Nasca river. The rugged Andean foothills, a barren stony desert, and valleys filled with neat orange groves were Maria's first taste of this part of Peru and she immediately sensed it could be her next home. But there were drawbacks, and the hotel in Nasca where she stayed she remembers well as 'the original Royal — a filthy and noisy dump'. Nights in the Hotel Royal were so disturbed that,

Los Estudios "Astronómicos" Incaicos" en Nasca

Noticias *24 December, 1941, reported that Maria Reiche was to continue the studies which Paul Kosok began.*

after a short rest, Maria always left her room in the middle of the night to look for a passing truck to take her to the desert pampa for sunrise. 'The drivers were kind to me', she said, 'they had to drive more than six hundred miles across the desert from Arequipa to Lima on such poor roads, yet they still bothered to take me to the pampa'.

Following Paul Kosok's suggestion, Maria began her investigation by looking for any lines laid towards the rising and setting points of the sun at its solstice. The time of year, midsummer in Peru, and a cloudless sky were as Maria remembers 'just perfect' on 21 December, and within the next few days she identified sixteen solstice lines.

The astronomy of the original desert people had never been given much attention, so the notion of an ancient calendar on the surface of the nearby pampa gripped the imagination of the local newspaper editor: 'Studies of Inca Astronomy in Nasca', proclaimed *Noticias,* Nasca's twice-a-week tabloid.

The writer gave the Incas, a mountain people, the credit for the desert markings, apparently forgetting that Nasca itself had a perfectly respectable history to call on: '18 December — Miss Maria Reiche a mathematics teacher is in Nasca to take measurements. The work will offer people everywhere some completely new ideas about the degree of Inca civilisation'. The next edition of the paper, Number 191, price ten centavos, continued the Inca theme, describing the lines as astronomical studies of the Incas: 'Paul Kosok found clear signs of the rudiments of Inca astronomical control on the hilltops and then on the pampa'. The writer went on to explain how Maria Reiche had studied the *hitos* or boundary marks which were known to exist in the surrounding hills. These hitos are heaps of stones resembling cairns dating from long ago and were well-known landmarks to the Nasca people. The mere fact that two foreign experts had bothered to take an interest in the local relics added weight to the news.

Once on the desert Maria had no difficulty verifying Kosok's original discovery relating lines to a solstice. For a few days either side of 21 December she saw the sun rising in the same place. After about a week the rising point appeared to inch long the horizon. By March, at the equinox, the sun would rise due east, announcing the arrival of autumn in Nasca.

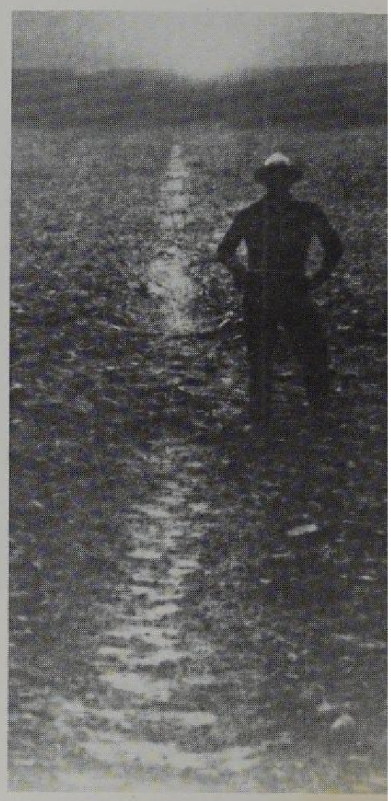
The sun's apparent movement has fascinated people of many cultures for centuries, so the idea of early inhabitants of the Nasca valley using the nearby desert like a blackboard for drawing their own version of a calendar was not preposterous. At least the construction was simple as desert is a natural scraper board. Virtually the entire area is covered by a surface layer of geologically reddened stones concealing a fine, yellow earth. By clearing the stones, or even scuffing their footsteps, the line builders left their marks. The riddle lies not in how they made the lines, but why they chose the directions.

Kosok put two and two together in 1941 during his visit and suggested looking for moon lines, planet lines and star lines. By the time he had involved

Maria, he had already hinted that some lines pointed to the Pleiades, a group of stars recognised through the ages. Greek mythology describes the Pleiades as the seven daughters of Atlas and Pleione, of which only six of the stars can be seen with the naked eye. Legend has it that the seventh star disappeared in antiquity. In the Americas the Pleiades were known by the Mayas who built great temples in the tropical forests of Mexico's Yucatan over 1,000 years ago.

Paul Kosok was well aware that the Pleiades were familiar to the early Peruvian coast dwellers, who called them *Fur,* and that they were regarded highly by Andean mountain Indian soothsayers. If lines pointed in the general direction of the Pleiades — or of the constellation Taurus, the Pleiades' position in the Zodiac, then that had to be additional evidence for a hidden calendar. Although Maria easily identified lines which pointed in the right direction, she realised that she faced an astronomical puzzle. It concerned the change in tilt of the earth's axis of rotation — a gradual movement which takes 26,000 years to complete one 'period', before it starts all over again. The effect of this changing direction is marked by a change of the pattern of stars across the heavens — the 'celestial sphere' of astronomers.

Maria realised that 'precession', or the apparent movement of the stars over the centuries, meant that a line pointing to the Pleiades in ancient times no longer pointed to them in 1941. Fortunately, she has always derived enormous pleasure from mathematics and could calculate the difference between the year when the line was drawn towards the Pleiades and the time at which she saw the stars in a particular position. So in calendar terms, the markings were another way of saying that the earth had shifted some centuries along its 26,000 year wobble. 'Another dimension — time, lies on the desert', Maria once remarked.



Maria Reiche took this picture of the midsummer sun setting at the end of a line.

Apart from the gruelling task of making her calculations by pencil and paper in the pre-calculator age, Maria had to take into account other technical points such as the height of the stars above the horizon and the height of the horizon above the level of the pampa itself. Both these variables needed to go into her equation or her research would be worthless. But on her first Nasca sortie, she simply did not have the necessary financial resources or instruments. The Pleiades and all they stood for would have to wait until next time.

Before leaving Nasca, Maria made one exceptional discovery which has often been credited to Kosok. By the simple though determined expedient of walking to parts of the desert as much as thirty miles apart, she found lines in one place drawn along more or less the same compass angle as lines in a totally different spot. Though such a discovery may be passed over with a shrug, on the basis that some lines are bound to follow the same general direction, the compass angles Maria found were far too close to suggest coincidence.

During many hours of lonely hiking between one measurement and the next Maria pondered the significance of her discovery. The most obvious conclusion, she decided, was that any line drawn towards the setting

Alberto Rossel Castro, a priest in Nasca, developed a lasting interest in archaeology. On one occasion he fashioned a suit from ancient burial cloths.

midsummer sun was bound to have the same compass angle however far apart the viewers, or original line makers, stood. Drawn on a map such lines would be parallel, and as her investigations progressed Maria found many parallel lines. Such accurate parallelism over wide distances implied that line makers in different places must have been looking at the same extremely distant objects — the midsummer sun was one such object.

Nearer objects, such as hills, would not account for the parallelism. Lines Maria drew on a map from two widely spaced places simply converged; she was facing a problem of logic very close to her heart, and remembers just how happy she felt: 'It was not yet my happiest moment — that came later when I was working on the animal figures, but I was very happy. It was marvellous'.

Maria believed she had found proof for Kosok's 'astronomy' hypothesis; the next step was to explain the way the calendar functioned. At first she was daunted by the scale of the problem: 'So many lines and such distances' — indeed one line is twenty-five miles long. 'Then I found more animal figures, eighteen altogether, including the giant bird, the whale and the spider. . . and then of course I needed to find out how they were involved'.

By the end of 1941 Maria had finished her work in Nasca and returned to Lima to write to Paul Kosok. It was then that the full force of the war intervened and, with America involved, Kosok's Nasca work came to a halt. Kosok found he was teaching mathematics, physics and scientific German as part of the war effort, while in Lima Maria's travel was restricted. As the United States entered the war the Peruvian Government offered the American airforce a desert base at Talara in the north of the country and put travel limits on some foreigners. Maria stayed in Lima sharing an apartment with Amy whose business flourished with the wartime boom. They had many common interests, particularly music, which they heard at local concerts and from Amy's fine collection of records, notably Beethoven and Bach. Maria especially enjoyed getting out of the city to the nearby hills and mountains at the weekends, and though at times she suffered from sciatica, she rarely complained even when it slowed her walking.

For the most part, Maria spent the war years in the company of British and American friends who 'offered great kindness'. For many years she and Amy shared an apartment in Lima beside the Parque de la Reserva, close to the centre of the old city. This attractive park had been laid out in 1929 in the days of President Leguía. Dominating the centre of the park stands a statue of Antonio José de Sucre, the general whose skill won the final battle in South America's struggle for independence from Spain. But while modern armies clashed across the heartland of Europe the quiet park was perfect for an evening stroll.

Although Maria continued to teach, she also took on the job of book-keeping for Amy's growing business, for Amy had begun to invest in building and Maria remembers how she became involved with 'accounts and supervision'.

The church in Nasca in 1938; it collapsed in the 1942 earthquake.

All this activity kept her occupied and her mind off the problems of communication with her mother and sister Renate in Germany. Nasca, too, was temporarily retired.

Following the allied landings in France, the war in Europe entered its final winter. In the southern hemisphere as summer approached Lima, Maria wrote a short seasonal article for the old-established daily, *El Comercio.* The sun and promise of fine beach weather is a popular subject for the people of Lima who have to endure long winter days of cool mist. 'At the end of this month', she wrote, 'we can expect a wave of warmth which comes each year at about the same time and is principally due to the changing angle of the sun's rays. . . at midday the rays fall almost directly from above'. The friends of the war years encouraged her to write and to think about recommencing work at Nasca.

In the three years since Maria had been forced to abandon her fieldwork there had been changes in Nasca. An earthquake damaged much of the town in August 1942, reducing both the church and part of the original Hotel Royal to dust. And on the matter of the desert lines the local priest, Father Rossel Castro, had begun to form an opinion — the first alternative since Paul Kosok put forward the 'astronomy book' suggestion. Possibly influenced by Toribio Mejía's idea that the lines were sacred paths, Rossel Castro expanded on the theme by suggesting that 'the paths were connected with astronomy *and* irrigation'. He was also concerned for the protection of the site, which faced threats from local farmers who needed land to irrigate.

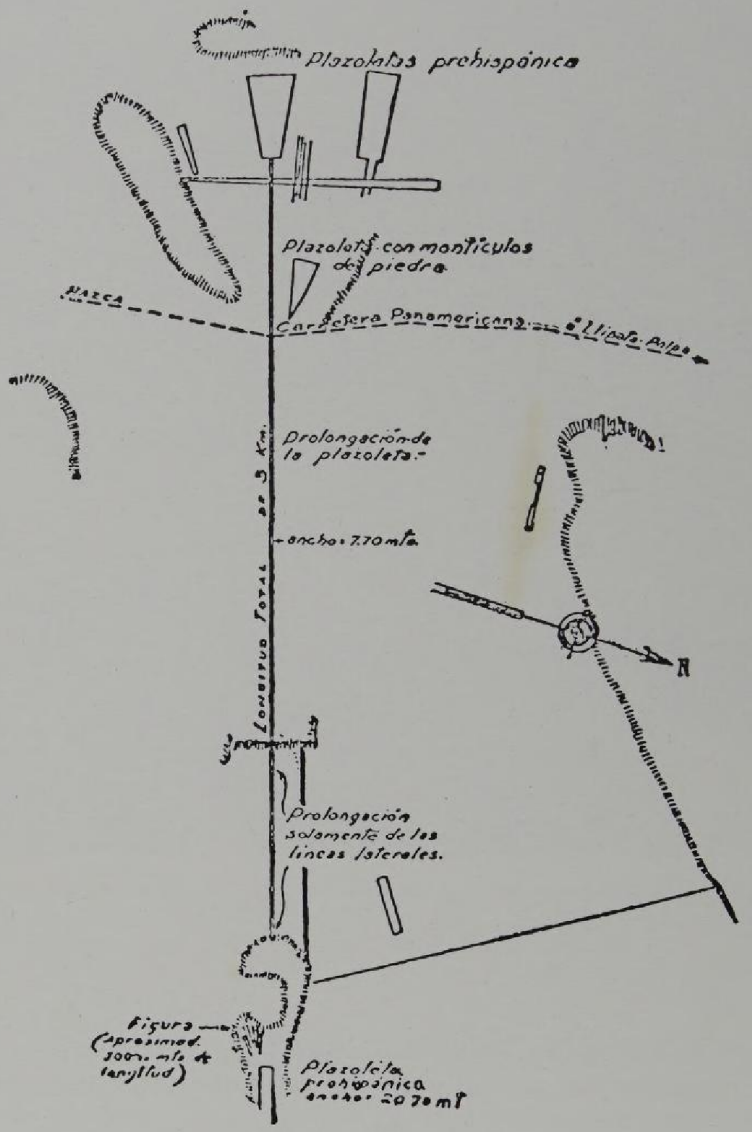
The desert pictured in 1944 when the area between the Rio Grande and Palpa was unmarked except for the ancient lines. These are the earliest known clear pictures of the lines. In the lower picture the Pan American Highway runs from right to left.

Clear pictures of the trapezoidal markings between Palpa and Nasca were taken by the National Air Photographic Service in 1945.

At about this time the Peruvian Airforce and an independent air survey company were mapping parts of the desert using specialised photography. The enthusiastic response to the 'lines mystery' by the staff of the National Air Photographic Service (SAN) has since become a vital part of the Nasca story. The first of many thousands of SAN aerial pictures were taken over the Nasca desert in 1944 and, together with those taken by various photographers travelling on Faucett flights, they have become a permanent record of the desert.

Even before Maria had the chance to return to Nasca, the lines were examined by the Peruvian Dr Hans Horkeimer, a lecturer from Trujillo University in the north of Peru. Horkheimer was returning from Chile at the end of 1945 when he saw the lines from the aircraft and was immediately fascinated. He decided to use part of his vacation for an excursion to Nasca and through influential contacts enlisted the help of the Peruvian Airforce. In February and March 1946 Horkheimer was given three special flights over the desert and he completed two ground excursions. Father Rossel Castro featured in the list of acknowledgements in Horkheimer's published report. Maria did not.

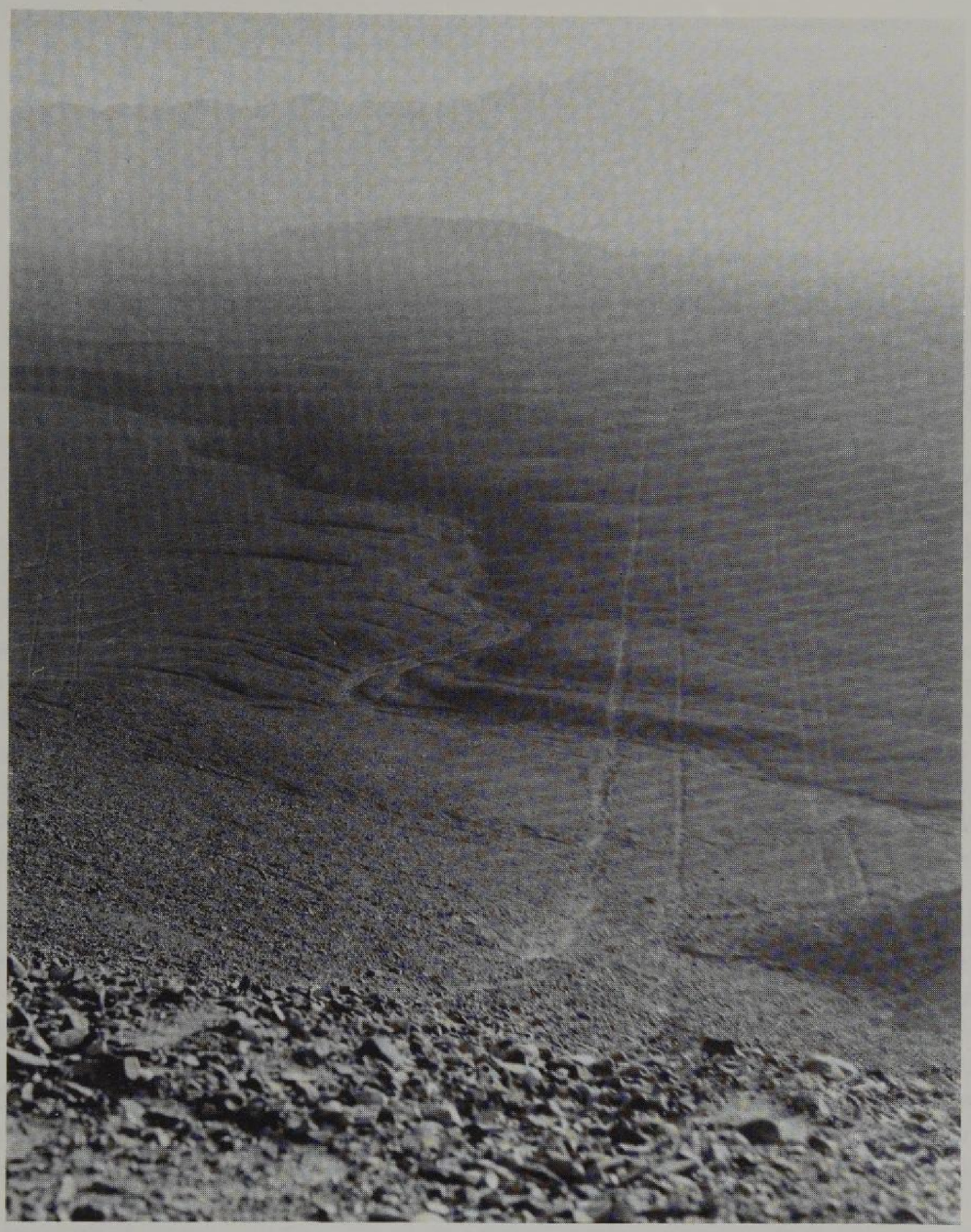
Dr Hans Horkheimer from Trujillo University in north Peru published the first detailed account of the lines.



Hans Horkheimer's sketch of the line between two hills on the Pan American Highway near Llipata. Paul Kosok and his wife Rose followed this line (also seen opposite) to the clearing and figure at its eastern end.

Courtesy National Library, Lima

The details announced by Horkheimer were the most systematic to date and included diagrams supported by photographs. While not setting out to oppose Toribio Mejía, Horkheimer pointed out that the lines were of many types — narrow, long, some broad, some trapezoidal, some huge rectangles — and often ascended steep hills. Horkheimer asked: 'Why?' Mejía had called them 'sacred paths', said Horkheimer, but 'surely "path" doesn't embrace the variety seen in the region in question?'



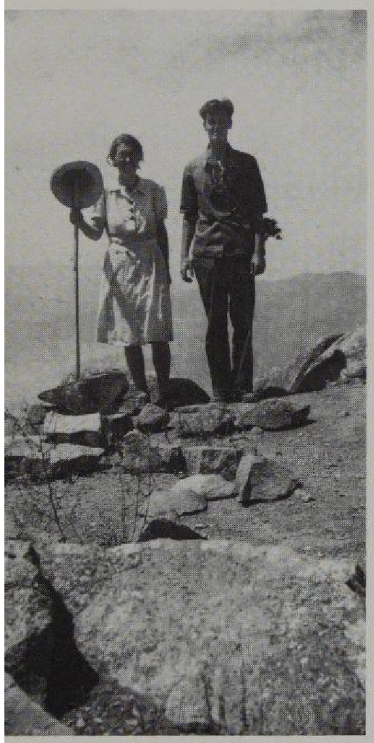
Lines from the hilltop explored by Kosok in 1941 and Horkheimer in 1946.

Turning to the Kosok astronomy hypothesis, Horkheimer was highly critical. 'Why did the ancients need lines many kilometres long or clearings a hundred metres wide to mark the position of something in the sky?' And 'Why in some places is there a veritable flood of markings, while in other places there is just the isolated triangle or rectangle?' And again: 'Why do some of the clearings which supposedly look towards the sun face instead to the south where no heavenly body graces the sky?'

To be fair, Horkheimer offered some thoughts. He asked the local people for their opinions. 'The peasant folk', he said, were not particularly interested, knowing only that the markings were by 'the pagans' — as they called their ancestors who were there before the arrival of the Catholic Spaniards. But from the educated people of the valley Horkheimer found a better response. He heard how they believed the clearings were places to hold games or were fields

for cultivation, and that the lines were directions for the well-known Inca messengers, the runners called *chasquis*. More extraordinary was the assertion that the geometric drawings were made to communicate with people of other planets.

Summing up, Hans Horkheimer favoured a connection with the well-recognised ancestor worship of the ancient Peruvians. The cult of the dead and reverence for departed spirits remains strong in the Andes mountains to this day. He found numerous stone constructions among the markings which he believed were tombs and he also noticed stones gathered in heaps — each formed with a central depression 'like earth ulcers'. Horkheimer called them 'stone discs'. These, he said, marked 'sacred places before which the people made sacrifices, their pagan invocations and other ritual activities'. In many cases the desert markings and stone heaps were close to the widely known cemeteries of the ancient Nasca culture. 'The clearings', Horkheimer wrote, 'were meant for sacred gatherings and the lines were used for dances — the ritual dances of ancient Peru were performed by one person following another in the form of a chain'.



Maria Reiche and Verne Grant, now a Professor of Botany, were exploring the desert in the early 1940s.

Almost every aspect of ancient lore apart from astronomy was embraced in Horkheimer's conclusion. He emphasised the way the lines could be a family tree. 'Each line belonged to one family and the lines leading to the clearings decided the origin and kinship of the people who gathered there'.

Horkheimer returned to Trujillo preparing to announce his discoveries and conclusions just as Maria was setting out to return to Nasca. A race to be first with the solution captured the imagination of the Peruvians, and the newspapers in Lima and Nasca were quick to report every fresh story and twist to the opposing theories.

Maria arrived in Nasca in June in time to watch the midwinter solstice. The pampa was cool and the air wonderfully clear. The *Noticias* of 27 June was headlined: 'Interesting archaeological revelation discovered by Miss Reiche', and the article, signed by Maria, talked of 'being close to the solution, or at least a partial solution, to the secret of the Inca Roads and the geometric figures found by Mr Kosok. . .' She continued by explaining how many lines pointed to the sun around the important date of 21 June. 'One day we expect to decipher the puzzle — if God so wishes'.

Maria could not afford to stay long in Nasca and, relying as she did on her meagre pay as a teacher and out-of-hours work for Amy, was forced to return to Lima. However, in the next issue of *Noticias* she wrote a letter to the editor, Agustín Bocanegra, expressing her thanks to the people of Nasca and apologising because she had not been able to call personally and tell the newspaper about her discoveries. She went on to say that the results of her research were positive and that she had seen the sun rising exactly at the end of one of the Inca solstice lines. 'I hope to return very soon — *Hasta la vista,* Maria Reiche'.

Next into print was Father Rossel Castro who was quickly gaining fame as a local expert and archaeologist. He gave *Noticias* a résumé of the story and outlined Horkheimer's work pointing to the probable kinship connection. Then he moved on to the lines, pagan gods, stone heaps — which he called *apachetas,* and finally the astronomical purpose. The 'monument', the priest repeated his call, should be declared an 'archaeological monument'.

A feature by Hans Horkheimer followed in *El Comercio.* He described his days toiling on the pampa when he and a colleague, Varona, had once struggled back to the road and stopped a car to hitch a lift. According to Horkheimer the driver, a French lady, had said: 'For the love of god just what are these things in the desert?' Horkheimer, 'dust covered and exhausted', continued his story with an account of the markings and his interpretation. But the Horkheimer theory, even with the overtones of sacrifice and ritual, never gripped the Peruvian imagination. Perhaps the suggestion of ancient astronomers hunched in darkness and sighting along the lines was more appealing. And certainly Maria kept the 'sunrise and solstice' interpretation firmly in everyone's mind.

One of her articles for *El Comercio* turned closer to Lima and the astronomical alignment of Pachacámac, an ancient adobe mud-brick pyramid some fifteen miles from the city. Pachacámac, a favourite for tourists even then, has been damaged by the rain which occasionally strikes the desert. It was an important shrine for the coastal people and was enlarged by the Incas when they invaded the region in the second half of the fifteenth century. Looking at the walls of Pachacámac, Maria found some of them to be directed to the solstice sun: 'The building was one of the finest testimonies of the ancient astronomers'.

Maria took measurements at Pachacámac near Lima in 1942.

LA INVESTIGADORA Y PROFESORA DE MATEMATICAS, SRTA. MARIA REICHE

AÑO VIII NASCA, 14 DE JULIO DE 1946 PRECIO: 10 CTVS. No 762

Noticias

INTER-DIARIO INDEPENDIENTE E INFORMATIVO

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By 1946 Maria was in the Nasca headlines and exploring the desert near the town.

This giant bird was one of Maria's early discoveries. It measures more than 450 feet from beak to tail.

The newspaper editors never failed to keep the Nasca story in front of their readers, and by 1947 Maria had made her name in Peru. She confided jokingly at a party in Lima: 'I'm a celebrity now', but outside Peru the story was different; the mystery of the desert markings still had to make an impact, and that fell largely into the hands of Paul Kosok who was waiting in New York for funds to support further desert studies. Kosok never sat idly, and in 1947 he wrote about the Nasca lines for three American magazines, including *Life;* each magazine also published photographs, and with the publication of these pictures the Nasca lines and Kosok's portrayal of their mysterious astronomical possibilities the seeds of world interest were truly sown.

But international fame did not touch Maria and she had to survive on a shoestring while somehow clinging to her place as the Nasca front runner. Time was on her side and she had plenty of it to make excursions to the pampa. What she did not have was money, and though San Marcos University in Lima — the oldest in the Americas — promised a small grant and a theodolite, Maria had to take into account months of costly travel. To eke out her slender budget she taught, translated and worked for Amy who also lent money for the fieldwork. Far more important than the money was Amy's tireless companionship and encouragement throughout many long expeditions.

Eventually the San Marcos grant was arranged, the debts repaid and the theodolite delivered. In Nasca Maria was given the use of a truck owned by the town, she gained the unreserved backing of a colonel from the Army Geographical Service on location there, and slowly her confidence rose.

The Nasca lines cover a large area, perhaps more than five hundred square miles, and Maria planned to explore much of this before Paul Kosok's impending return. Her 1941 investigation had been centred on the lines near Llipata, twenty-seven miles from Nasca. At that time she used the farm or *hacienda* of San Javier as her base. For the 1947 expedition she intended to examine in great detail two areas: one at Achaco only four and a half miles from Nasca, the other a pampa overlooking the Ingenio river valley at San José. It is this San José pampa which has finally brought the Nasca lines to world attention.

The Achaco site had many advantages; top of the list was its accessibility. Maria could walk from the Hotel Royal in less than an hour. Once past the last cotton fields the edge of the valley signals the beginning of the desert and this was where Maria found many types of line and an animal figure known as the whale. Altogether in this one area lay ten large clearings, one of them nearly nine hundred yards long. All the clearings were linked in some way to narrow lines and many were set close to hills. From one small group of isolated hills a perfectly straight line led unbroken for some three miles. Maria plotted and measured all the markings and produced the first plan of this site.

On the other side of the same desert pampa, the San José complex offered a far greater wealth of drawings. Maria had found some of them in 1941 when

she briefly visited the spot. One massive clearing dominates the western side of the desert highway, while east yet more lines, spirals, a huge bird with a zig-zag neck and some very clear trapezoidal clearings stretch to the foot of the Andes mountains. It was in relation to this site that Hans Horkheimer had questioned why so much was needed to make astronomical observations.

Once again Maria set about the arduous task of plotting the markings on a map, though she now had some excellent aerial photographs from SAN to guide her. Other studies she made at this time related to a re-examination of her compass angles to find those along which the majority of lines were laid down. Every scrap of information was noted carefully, often with the assistance of local Nasca people. One young man who helped in those early days was a student, Antonio Cordova, who was taking a correspondence course in photography. Among a number of photographs he took was one which appeared in *El Comercio* of Maria at the top of a step ladder on the pampa. In the photograph, Julio Fernández, manager of the Hotel Royal, was helping to hold the ladder steady. 'They were always willing and very quick to understand

Julio Fernández, now in his nineties, was the manager of the Hotel Royal. He helped Maria many times, and stands on the left of the ladder in the photo below.

EL COMERCIO.—LIMA, JUEVES 12 DE DICIEMBRE DE 1946

LA PAMPA DE NAZCA ES EL LIBRO DE ASTRONOMIA MAS GRANDE DEL MUNDO

Por MARIA REICHE

(Especial para "El Comercio")

Estas líneas y círculos formados por piedras, hace siglos que guardan un secreto, cuya revelación obtendrá la ciencia y el mundo admirará.

En la hoya del Río Grande existe uno de los documentos más misteriosos y más interesantes de actividades antiguas que se encuentran en el Perú y quizas en el mundo.

El doctor Horkheimer, distinguido catedrático de la Universidad de Tríptolo nos ofreció, en "El Comercio" del nuevo de octubre, la descripción interesante de un viaje por aire y por tierra por esta región que ha llamado la atención de todos los q' viajan por aire en el trajecto Lima-Nazca y Lima-Arequipa.

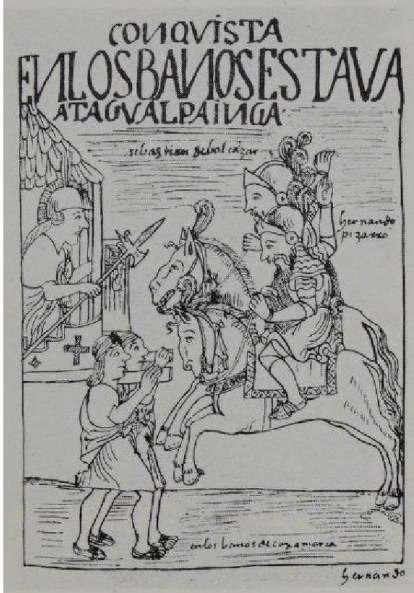
Al acercarse a Nazca, entre la notoria de las planicies desierta, el viajero de repente despierta mirando, lo que parece de arriba una pizarra extendida de color oscuro, cubierta de dibujos, que parece sacada de la pared de un salón de matemáticas, donde también se enseñan las artes decorativas y ornamentales. El turista, apresuradamente, saca su cámera para fotografiarla y muchos son que han logrado buenas fotografías, hasta que el Servicio Aero-fotográfico Nacional, en el año 1944, sacó una serie maravillosa de fotografías que están esperando ser estudiadas por los científicos y los aficionados para satisfacer la inmensa curiosidad de los viajeros y también de la población del lugar.

¿Qué cosa se ve al viajar por estos ríos? Casi nada. Una pampa inmensa y desolada, aparentemente sin vestigio de actividades humanas actuales o antiguas. De repente, uno se encuentra con un sendero angosto como los que se usan para el tránsito con mulas. Este sendero de dos o tres pies de ancho se extiende hacia el horizonte horizontal en una línea absolutamente recta como si fuese dibujada

Maria Reiche durante sus exploraciones, en Nazca

Maria wrote for the Lima paper El Comercio *in response to an earlier story by Hans Horkheimer.*

Maria on the step ladder to get a better view of the lines.



The Spaniards Hernando Pizarro and Sebastian de Benalcázar meet the Inca Emperor Atahuallpa in Cajamarca. A 17th century illustration by Guamán Poma de Ayala.

my work', Maria remembers. 'They knew I couldn't pay and still they offered to come. I was showing them something new on the pampa every day'.

While on the surface her work progressed well, Maria was aware of criticism and sensed undercurrents of disapproval. After all, she rationalised, she was not an archaeologist and she was getting a great deal of publicity. But she could not let such thoughts deter her progress and forged ahead. She did not stop even when, in early 1948, Amy took a short trip to the Amazon jungle on the far side of the Andes mountains. But some months later, when Paul Kosok had still not arrived, her lack of money and failure to get the results she expected almost forced her to give up.

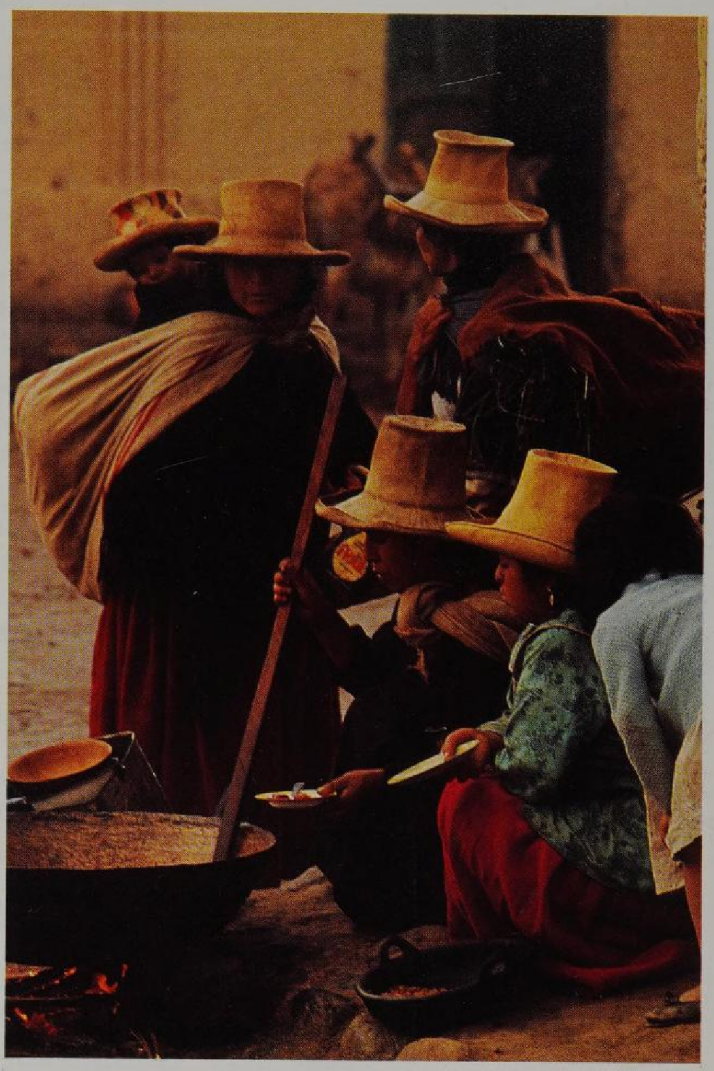
Some of the previously silent critics began to voice opinions. Among them was Father Rossel Castro, who wrote to *Noticias* saying that in her work Maria was to some extent changing names of local places. If this continued it could make future studies difficult.

So when eventually, after a seven year absence, Paul Kosok arrived in Lima, Maria greeted him with mixed feelings. For all those years she had worked alone on the problem and suddenly here was Kosok, the originator of the astronomy theory, with all the international weight behind him. Now he could offer her expenses and take all the credit. But more than ever before she did not want to give up her very private happiness on the pampa: 'It was a very special beauty, something I can't describe'.

It was agreed that Kosok and his seventeen year old son Michael would rent Maria's Lima apartment while she continued to work in Nasca. The extra money would help towards her Nasca costs. This time, when Maria returned to the pampa, she was equipped with a Swiss theodolite on loan from the Army Geographical Service, and she was determined to get a result before Kosok. Aside from the personal challenge, Maria needed to generate some international scientific interest in the subject. Academic opinion at the time considered these mysterious desert lines were a curiosity to be pushed under the mat, although coupling them with Kosok's name would give them a certain respectability. Together they planned an article for the reputable American journal *Archaeology*.

Paul Kosok and Michael arrived in Nasca to find Maria 'out of town'; they installed themselves in the new Tourist Hotel and Kosok called on Agustín Bocanegra, the friendly owner of *Noticias,* and waited for Maria to return. Once reunited their work apparently went well, though Maria soon headed back to the pampa to continue her personal observations. Kosok and his son went in another direction.

On her return to Lima, Maria told her friends that she would have to come to some agreement with Kosok; on the one hand he had introduced her to the lines while she, on the other, was dedicating her life to the problem. Despite a certain tension between them, at least the lines of communication never broke down completely and Maria agreed to join Kosok in northern Peru the



Cajamarca offers a rich blend of life, with traditional Quechua Indians, colonial architecture and modern Peru side by side.

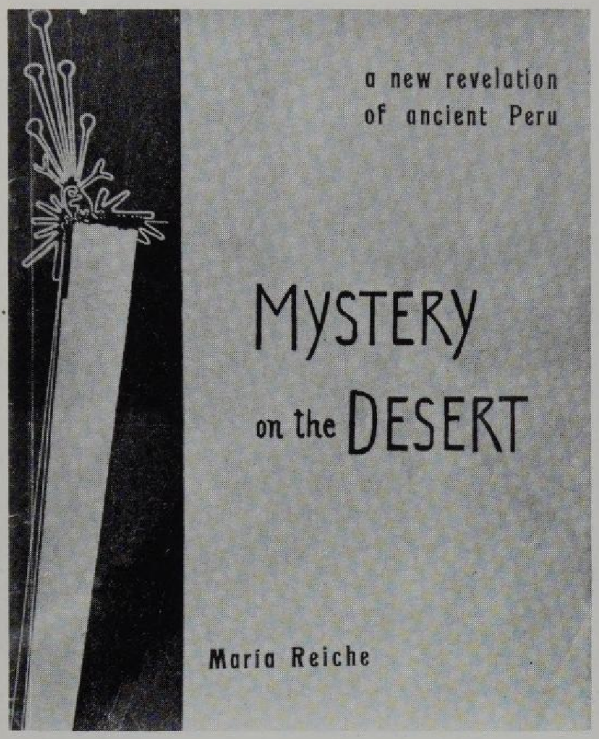
following year. He was preparing the manuscript for a book and once more asked her for help with translations. There was also the *Archaeology* article to consider.

The next two years were filled with a mixture of frustration and success. Early in 1949 Maria set out for the mountain town of Cajamarca in northern Peru. Cajamarca, 9,000 feet up in the Andes, spreads across a lush green valley, famed locally for its rich dairy products. The cool climate suits the almost European way of life set among colourful Quechua Indian homes. The Spanish invaders settled there after Francisco Pizarro and his small band took control of the Inca Empire. Atahualpa was ambushed and captured just outside the town.

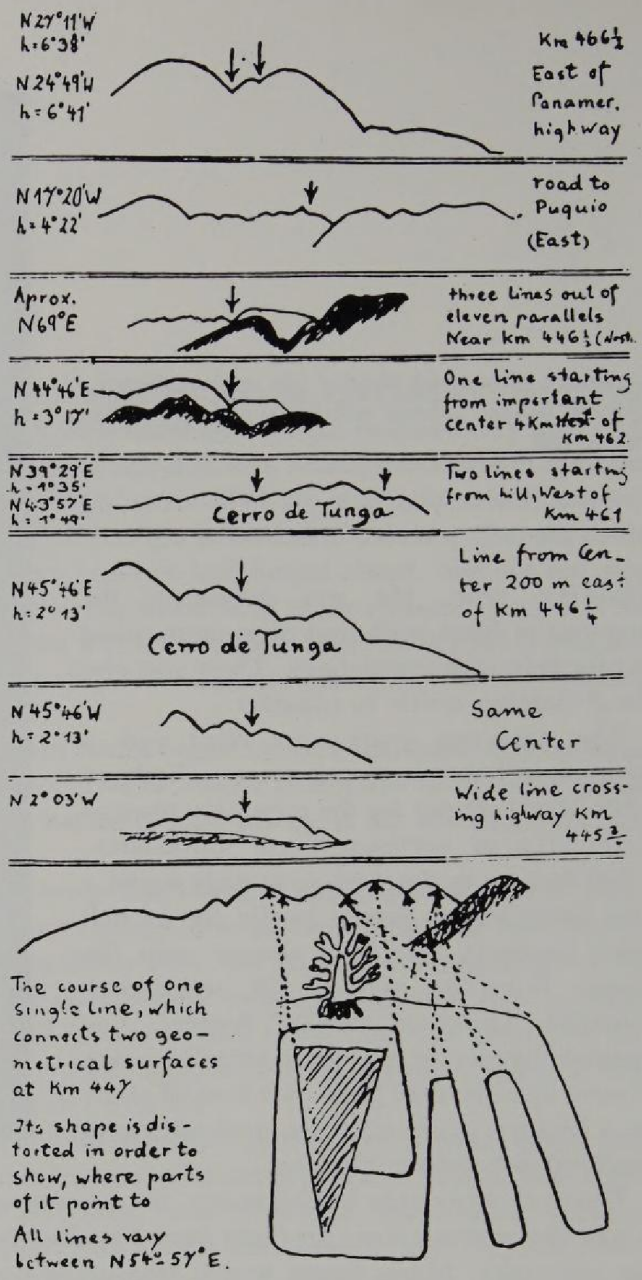
Kosok chose to write in Cajamarca, for not only was the cost of living lower, it was also within a short air flight from Trujillo where he had good friends at the university. Maria found herself translating descriptions left by Spanish writers, mostly priests, who travelled with the soldiers and settlers. The 'Chronicles', as these fascinating documents are known, are scattered throughout the libraries of the world and more pages come to light each year.

Meanwhile at the same time as puzzling over the intricacies of seventeenth century Spanish, Maria was working non-stop on her private project. For some time she had been planning a small book she intended to publish in Spanish and English editions. She wanted this book to be the first, and thus potentially the most important account of the issues at Nasca. Both editions were to be illustrated with the latest photographs and her own unique maps.

The Spanish edition, a booklet with twenty-five pages of description and many original photographs, was the first to be published. The Lima printer undertook the work on credit and Maria was responsible for all the preparations including the design of the cover. Only 1,000 copies were printed and brisk sales covered the costs in a month. 'That was lucky', Maria admits, 'I no had money so I was living on grapes and a few biscuits'. But this first sign of success gave her the confidence to present an English edition of 2,000 copies.



Mystery on the Desert *was published in Lima in 1949 when Maria was waiting for money to fund her work.*



In her original Mystery on the Desert, *Maria Reiche published sketches of the rugged desert horizon and the places towards which some lines are orientated.*

The contents of the English edition are somewhat different from the Spanish, which is aimed more at readers familiar with the places and people of the day. Friends gave Maria plentiful advice and were often highly critical of her style, but she shrugged it off and the English edition benefits from her 'no-frills' clarity. She devised the title *Mystery on the Desert* and the book became an immediate best seller, with the Peruvian Government ordering the first hundred copies before it had been printed.

Mystery on the Desert fills one of the biggest gaps in the story of the Nasca lines because within it Maria described the pampa as she found it. The other archaeologically oriented descriptions of Nasca remains and excavations concern the valley or the nearby graves. Maria's book says something about the pampa — the flat 'blackboard' outside the town, as the newspapers were beginning to call it.

After describing the shapes, conditions and reasons for the survival of the markings, Maria turned to the centres from which a number of lines radiate. 'From the air or on small scale maps these centres appear as sharp points. In

reality they are central areas', she wrote. Such central areas were mounds or small hills with as many as twenty lines around them and, as she said, they are 'a common feature'. She called them starlike centres.

Another of Maria's early observations was the way that designs were laid one on top of another: 'The borders are either interrupted, forming entrances or exits' — from one pattern to the next — 'or the edges of one or both designs continue uninterruptedly inside each other', implying an overlap possibly of tracings of different ages. Today such information is invaluable, bearing in mind the rapidly changing face of the site.

On the subject of any relics she found on the lines or anything which could have been left there by the line makers, Maria mentioned stone heaps and described pottery, most of it broken decorated ceramic belonging to different periods of the Nasca culture. Then she spoke of how 'vessels had been found intact on the surface and apparently in the same place where they were left perhaps a thousand years ago'. The book records how 'stones with designs on them were found in two places'. One stone held a design representing a snake's head and a small trophy head, no doubt recalling the Nasca custom of collecting heads of their enemies.

Maria's books give credit to the explanation of Dr Paul Kosok, though in her critique in *Mystery* she commented that 'simply having lines dividing the year into two halves marking the solstices of June and December was insufficient proof for the astronomical meaning of the markings'. Then, almost as an afterthought, she reflected that facts pointed that way and so 'an attempt should be made to reach a definite conclusion for or against the theory'.

With the success of her books the 1940s finished well for Maria and she began to talk of 'a better, perhaps an international, edition of *Mystery on the Desert*. Kosok left Peru for the last time and Maria, who had assumed the character of a perpetual student, returned to the desert. Early in 1950 she arrived at a settlement by the peaceful river of Ingenio fifteen miles from Nasca. The pampa of San José was only a few yards from the road and here Maria found the adobe built store of a local *hacienda* whose owners, three Englishmen, she had met on previous visits. One of them, Lyndon Evelyn, remembered how Maria asked if she could use a room in their store as a base as she needed somewhere to leave her maps and instruments when she was away in Lima; a bed and blanket would also be useful.

At first Evelyn and his colleagues refused, believing the isolated store could be unsafe overnight, for bandits and robbery were common in those remote parts of Peru. 'She was very persistent and begged us to lend a room', Evelyn said. 'It was no place for a lady but she was prepared to take the risks and in the end we gave in'. The one room Maria chose at the rear of the store was dark with an earthen floor and badly fitting door. But in every other way it was perfect. At last she was ready to stay until she found the answer to the desert mystery.

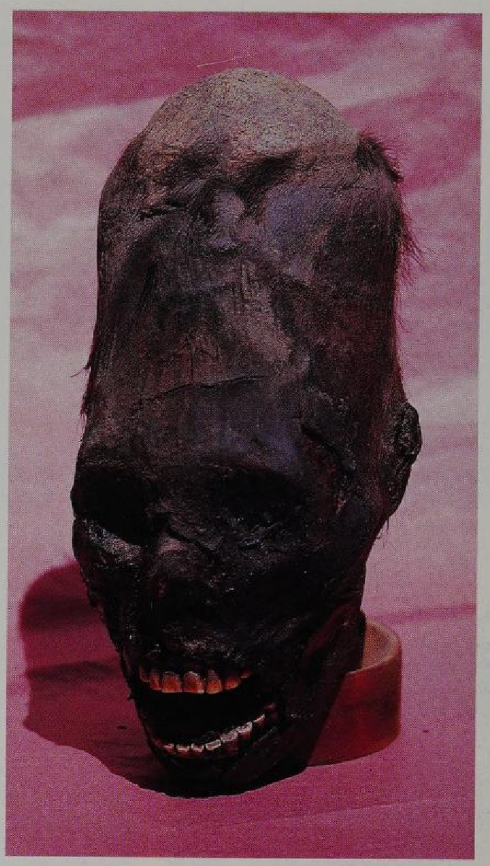
Simple rock drawings by the early inhabitants of this ravine above Palpa. Some features of these petroglyphs are similar to certain of the desert markings.

CHAPTER 3

The Line Builders

The true identity of the line builders has never been discovered. That is not to say there is no evidence, just that the pointers are circumstantial. To make matters worse no written accounts exist, for writing was unknown to the original inhabitants of South America, and chroniclers accompanying the Spanish conquerors of the Incas appear to have written sparsely about this corner of the desert. Given these limitations, most reasoned guesses arrive at a construction date of sometime between one and two thousand years ago. But even with such broad limits, the possibility exists that some of the straight lines may be relatively recent additions, while certain figures may be far older.

This coast of South America has been inhabited for many thousands of years, beginning perhaps 15,000 years ago when the climate of the nearby Andes was cooler and wetter. The people lived very simply by hunting wild animals and gathering edible plants. Traces of a bygone meal were found in a mountain cave due north of Nasca and dated by the radio-carbon method to approximately 13,000 BC.



Above, textiles made by the Nascas were finely decorated.

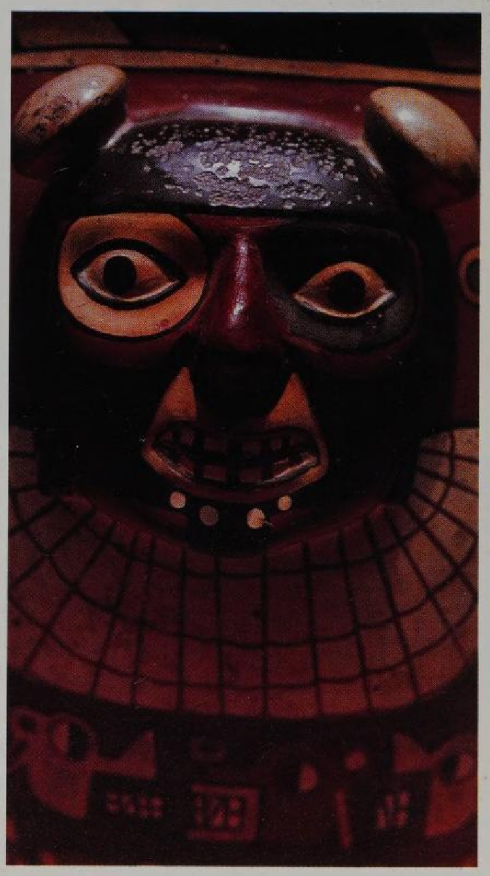
Right, the Nascas deformed their children's heads, possibly for spiritual and aesthetic reasons.

From modest beginnings and over many generations, the desert valleys at the foot of the Andes were settled and cultivated. Maize was introduced by contact with other tribes along the mountains and eventually identifiable cultures became established. Identifiable because archaeologists can point to certain distinctive relics and customs, such as burials, which have been protected by the desert climate. In the area close to Nasca the most striking development began about 500 BC with an artistic innovation of designs on simple ceramics. These were the earliest days of the so-called 'Nasca Style'.

Right, colours from minerals were used to paint Nasca ceramics.

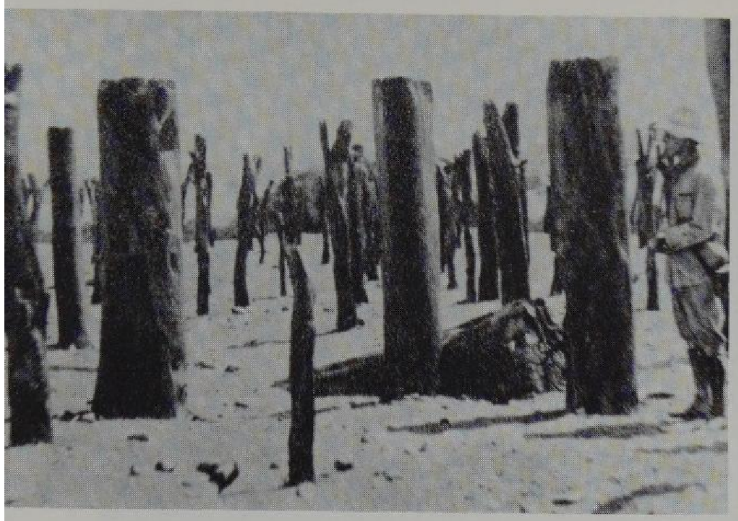
Below, some cotton mantles are decorated with feathers from the brilliant birds of the valley.

All the items on this page are about two thousand years old.



An eroded pyramid of mud bricks was the Kahuachi shrine.

The name 'Nasca' is believed to stem from a much later epoch when a governor, Lanasca, controlled the region for the Incas who invaded from their mountain fastness in the late fifteenth century. By usage the name 'Nasca' has remained, though some local experts have said the people who originally dominated the valleys of the Rio Grande for more than a thousand years until approximately AD 550 may have been known as the 'Kahuachis'. A local name, Kahuachi, is used as evidence and refers to a shrine almost thirteen miles due west of Nasca town. At first sight, and especially from the ground, there is little to mark the scale of the work. Centuries of sand blasting by ferocious desert winds have eroded the ancient walls to an indistinct outline



An array of posts was built near Kahuachi. In 1926 much of it was standing (left) and recorded by an American archaeologist. Now just a few posts remain (right).

and this softened form is blanketed by layers of mud. Occasional heavy rain has sluiced the original adobe bricks which the Nascas used to fashion six pyramids based on natural mounds. The highest rises over 65 feet and at its foot lies a walled court of more than 4,000 square yards.

Kahuachi was a religious centre and the focal point for the people of the surrounding valleys who, far from comprising an organised society, lived as scattered groups of reasonably prosperous farmers. Each family or kinship group occupied separate lands and it seems likely that they gathered together at certain times of the year. As farmers their lives were tied to the seasons and water supplies for their crops. Without water the valleys can be inhospitable places, so the Nascas built their shrine at an important position on the southern bank of the Nasca river course where clear phreatic water surfaces. During many months and sometimes for years the rest of the river can be dry.

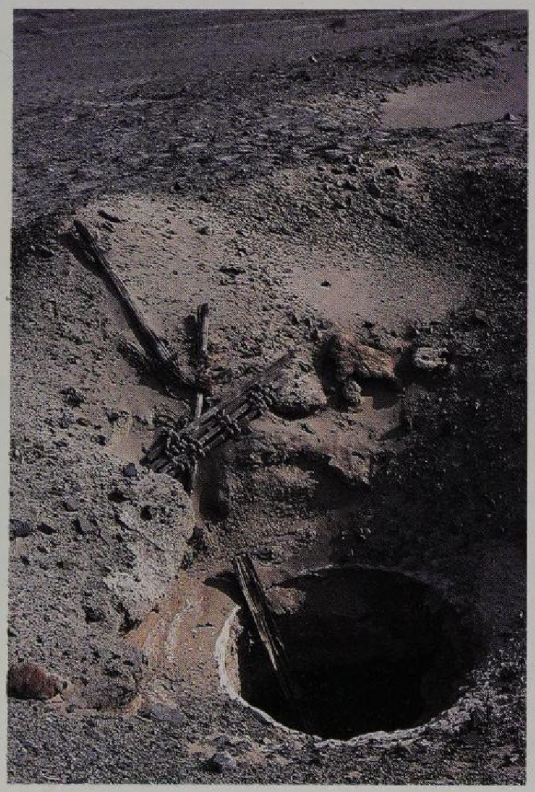
Close to Kahuachi, and on the same side of the river, the Nascas built another shrine or temple of wooden posts (mostly from trunks of the huarango tree, a relative of the mesquite) which they probably covered with some form of light roof — perhaps cloth or basket work. Winds have long since removed the roof and recently charcoal burners have taken many of the posts or *estacas*. The *Estaquería,* as it is known locally, once boasted 240 posts in twelve rows of twenty and was virtually complete in 1926 when photographed by the American archaeologist Duncan Strong. The remaining wood has survived well, but the cemetery which surrounded the site has been plundered. Hundreds of graves lie open, with bones, mummified skin and eyeless skulls littering the sand, thrown there as worthless by the *huaqueros* or treasure hunters. Even these relics are disappearing as souvenirs with the visitors who venture down the valley from Nasca.

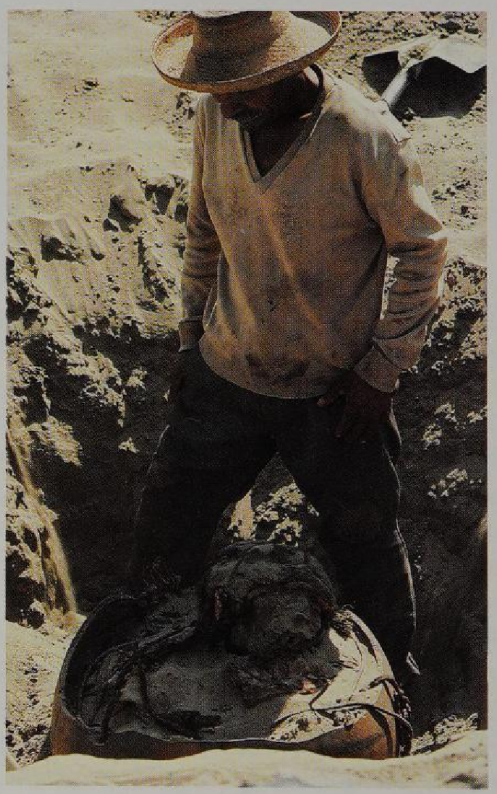
Another row of hardwood posts, *Estaquería chico* — the small *Estaquería,* is relatively isolated beyond another spur of the desert just a mile down river. Like its larger counterpart its exact function will remain unknown. Some of the lines and earth markings seem to lead towards Kahuachi and several large clearings adorning surrounding hills. But while these structures may help put some perspective in the history of the valley it is the nearby graves which have most to tell.

Wooden head of the Inca period found in the coastal region of Ica, north of Nasca. The dryness of the desert has protected the carving for over 600 years.

After the grave robberies the valley sides were once a charnel house of bones; even these have disappeared as souvenirs with tourists.

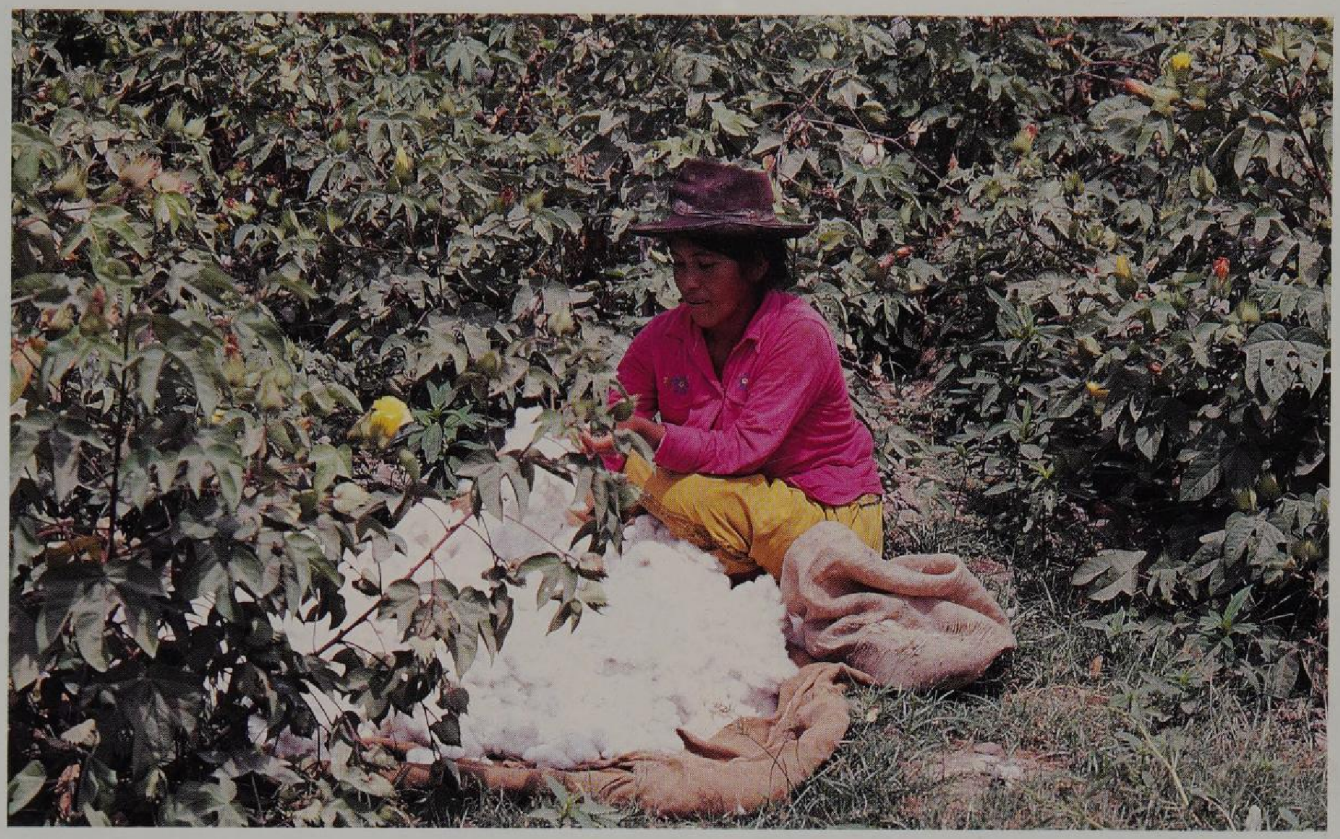
These pockmarks at the edge of the Nasca valley are plundered graves. In the past fifty years many thousands of tombs have been opened.





Far left, a Nasca burial. The wood and rope-work cover to the chamber has been cast aside.

Left, some burials were made in large earthen pots.



Wild cotton was plentiful in the Nasca valley. Now a hybrid, it is the principal crop.

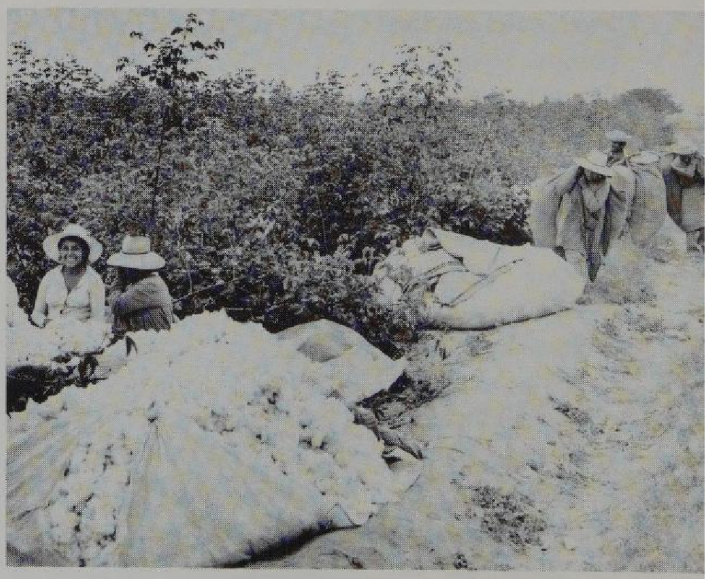
Apart from the lines — if indeed they are Nascan — few other clearly identifiable relics from the Nasca days have survived on the surface of the desert. The people may have lived in simple houses of wood and basket work, easily made from local materials and cool during the warm months. A Nasca home may have been similar to the *chozas* or simple dwellings of countryfolk in the valleys today which soon fall apart and get blown away when deserted. As Maria Reiche has often said 'the desert cleans itself'.

Graves, many thousands of which have been discovered, are the best clues to the Nasca occupation of the valleys. Usually they are found together in cemeteries sited in the dry sands of the valley edge, seldom on the higher ground of the desert pampa. Some graves are shallowly placed, others are as much as fifteen feet deep. Construction was far from uniform, though a round or square chamber at the bottom of a shaft seems to have been customary. The body was flexed with knees to chin, wrapped in cotton cloths and then placed in the chamber with pots and other goods: seeds, spindles for spinning cotton, dolls, combs, occasionally even finely hammered gold — indeed such a variety of beautiful relics that grave hunting became a hobby for many landowners in recent times.

Putting a date on the end of the Nasca dominance of these valleys has kept archaeologists busy since the beginning of this century. One generally accepted view concerns a strong influence from people with their own culture established in the nearby highlands. The effect on the Nascas was abrupt, and after approximately AD 550 their artistic style changed.

With other regional changes — notably an upsurge of talent and culture in the nearby Ica valley — the inhabitants of the Nasca valley lost their original identity. Then came the swift dominance of the Incas and, finally, in the late sixteenth century, almost the entire population succumbed to an epidemic — probably smallpox introduced by the Spanish invaders. One Spanish writer

Nasca main street is a meeting place for people from the desert valleys and nearby mountains.

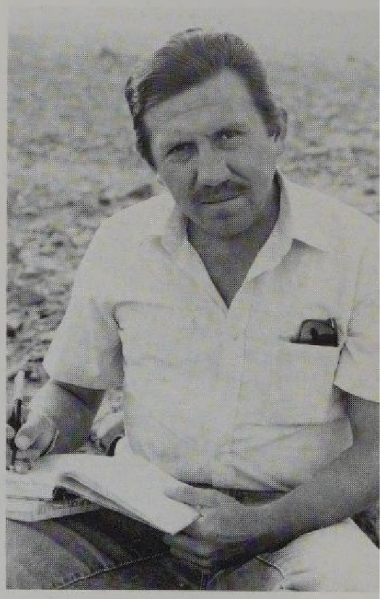


Left, in January the rising Nasca river often floods nearby farmland. Right, cotton is the mainstay of valley economy.

Nasca schoolboys built a 'line' experimentally in 1977 for local archaeologist Josué Lancho and BBC television. This local scholar thinks building straight lines is relatively simple: 'They could have used three poles, or just two if a distant sighting point was involved'.

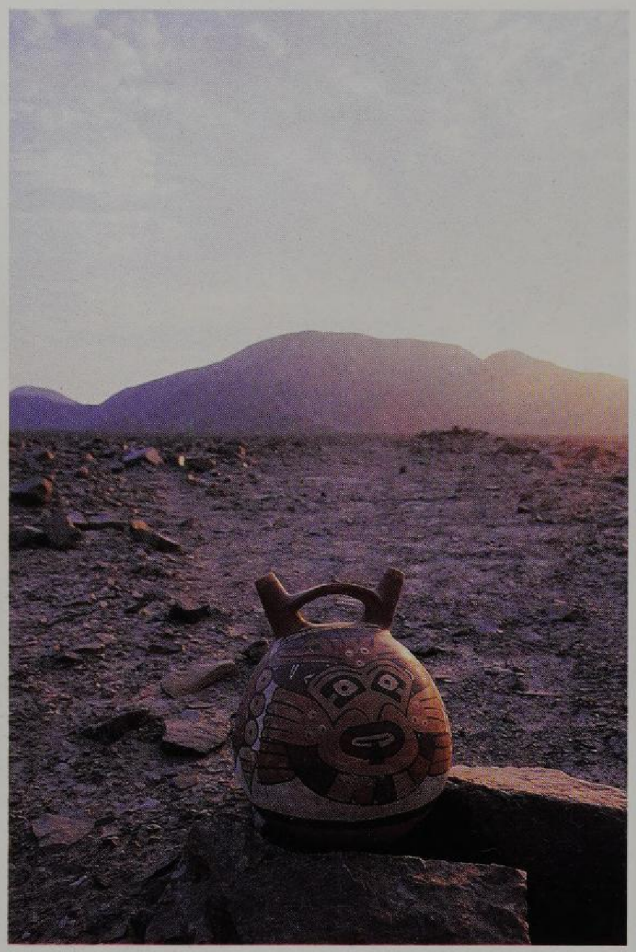
recorded the devastation in the Chincha valley, roughly 130 miles north of Nasca: 'Of the 30,000 people who live in the valley only 600 or a little more were now alive'.

Without people the Nasca region was a wasteland of little interest to the Spanish settlers, but eventually the valleys of the Rio Grande were occupied. Farms were established and labour brought in from wherever the landowners could find it. Few indented workers came from other parts of the coast, for the smallpox epidemic had made them valuable to the landowners there. The best source of labour was found in the Andes and the landlords scoured the villages for Quechua speaking mountain Indians. Over the years of intermarriage the remaining Nasca valley population was absorbed. Spanish blood was introduced; then other Europeans arrived, followed in the late nineteenth century by Chinese labour in bondage. Thus it is hardly surprising that any family memory of the Nasca lines has been virtually obliterated.



Josué Lancho.

As Hans Horkheimer discovered in 1946, few of the modern residents knew anything about the lines and many did not even realise they existed. But the lack of evidence or even hearsay cannot be taken as proof that the desert markings were not the work of the Spanish landowners or their farm workers, though they are assumed to be ancient since no references to more recent line makers have been unearthed in local records.



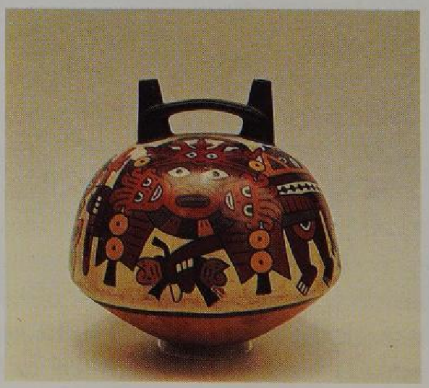
According to Maria Reiche some unbroken pots were seen on lines in the early days. More usually these vessels have been found in pieces.

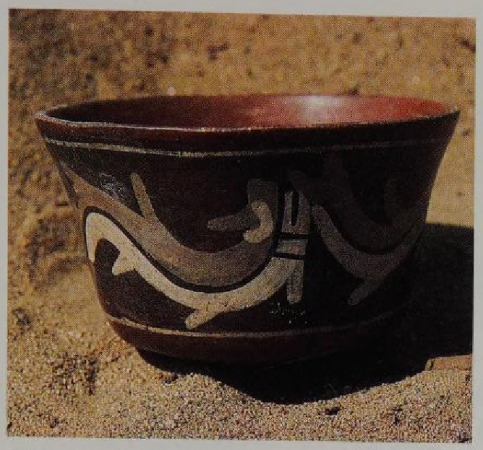
Gerald Hawkins reconstructed this pot from pieces found on the Nasca pampa. It was identified as approximately two thousand years old.

Magnifying glass in hand most investigators have searched the lines for clues. Maria Reiche in 1948 mentioned broken Nasca style ceramics and a couple of intact pots found on the lines. She also mentioned wooden posts which at one time stood among the markings, but they have gone with the wood gatherers. After Maria's early reports the search continued, sometimes to the extent of piecing together the original object. The pieces are often found in concentrations at intersections or at the ends of lines, and this has lead to a cautious conclusion that the Nascas were the line builders. Cautious because the object could have been put there after the line was built; perhaps not even by the Nascas whose wares could have remained in use for some time.

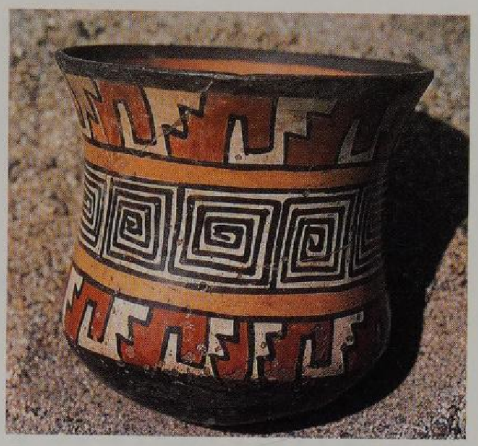
Similar detective riddles surround the remains of wooden posts on the lines. Duncan Strong, who uncovered a stump of wood in the 1950s, radio-carbon dated it to between AD 445 and 605. Another radio-carbon dating by Duncan Masson of a similar stump from a different line gave a date of sometime between AD 410 to 570. As Masson noted a few years before he died: 'The dating techniques had improved'. Interestingly both dates span the very end of the Nasca era or the time when outside influences arrived in Nasca. 'The plot thickens', Duncan Masson wisely remarked. 'And straight lines are not just Nascan. You'll find them in other places, too'.

The designs on Nasca pottery are clues to its age. From left to right the pieces below are dated 250 BC, AD 100, AD 250.





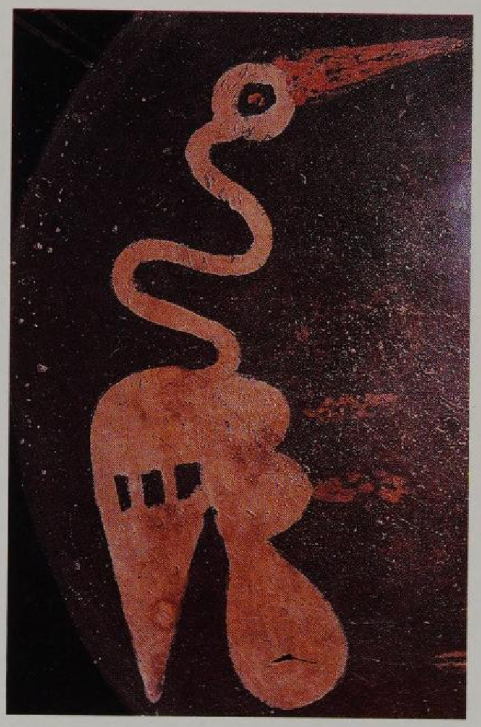
Fish or whale



Spirals

Many designs on Nasca ceramics resemble the figures on the desert, though usually the form is different.

Spider

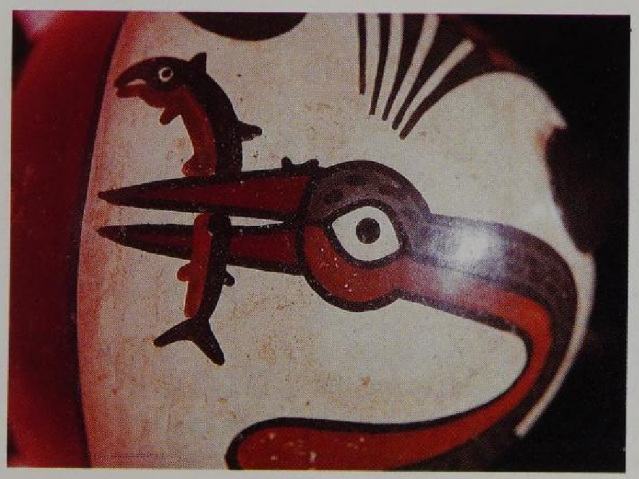


Heron or cormorant

In 1968 Ted Pelikan, an amateur archaeologist, explored this line near Lima.

This stump of wood on a line was found to be approximately 1,400 years old. It could have been placed there after the time of the Nascas.

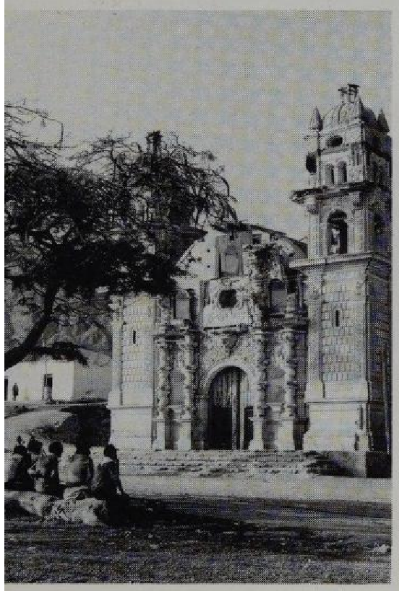
Bird and fish



Fox

CHAPTER 4

The Monkey of Saint Joseph



The near-derelict Church of San José; much of the interior work is now in a Lima church.

Maria made her home beside the gentle Ingenio river. Across the road from the front door of her storehouse a winding path climbed from the mimosa-studded thickets of the valley to the pampa of San José. For the first time since beginning her desert work she felt luck was with her.

One reason for optimism was her immediate acceptance by the local people — mostly farm workers whose lives, like Maria's, were regulated by the sun. Several farms occupied the narrow Ingenio valley, the nearest to Maria's lodging being the Hacienda San José, dominated by a fine baroque church, whose patron saint, St Joseph, gave his name to the area. The lavishly carved stone façade is a relic of the Spanish colonial occupation of the valley and in recent years has been declared a national monument. The other large farm, the Hacienda of San Pablo, then owned by Lyndon Evelyn and his colleagues, lies on the south side of the valley along a dusty track about five miles from the road. The town of Nasca is across the desert to the south, though, as Maria quickly found, she was virtually self-sufficient and needed few supplies.

In February 1951 *La Prensa,* a Lima newspaper, reported that Maria was living in 'a small house' in San Pablo and receiving a 'small' amount of money from the United States to help with her work. The article went on to say that her attention had turned towards the animal figures and an interpretation of their meaning.

The pampa of San José, with its puzzling concentration of animals, spirals and unidentifiable patterns, was indeed Maria's first objective and she began to search for clues across an area bounded by five miles of the Ingenio valley and approximately five miles of mountain foothills. On some excursions she walked even longer distances to inspect numerous craggy hilltops to which some lines were directed. For these lonely hikes she carried only basic food and a blanket and slept on the bare ground beneath the stars, with night-time temperatures often reaching close to freezing. She took all her drinking water (which came from the river or a small irrigation channel near the store) and sterilised it by boiling it on a spirit stove.

Maria maintained a strict vegetarian regimen, but she was also careful about the cost of what she ate. Sweet potatoes, or *camotes,* for example, were half the price of ordinary potatoes and plentiful, so they formed the basis of her every meal. Three varieties of camotes were grown locally and the plant, which is

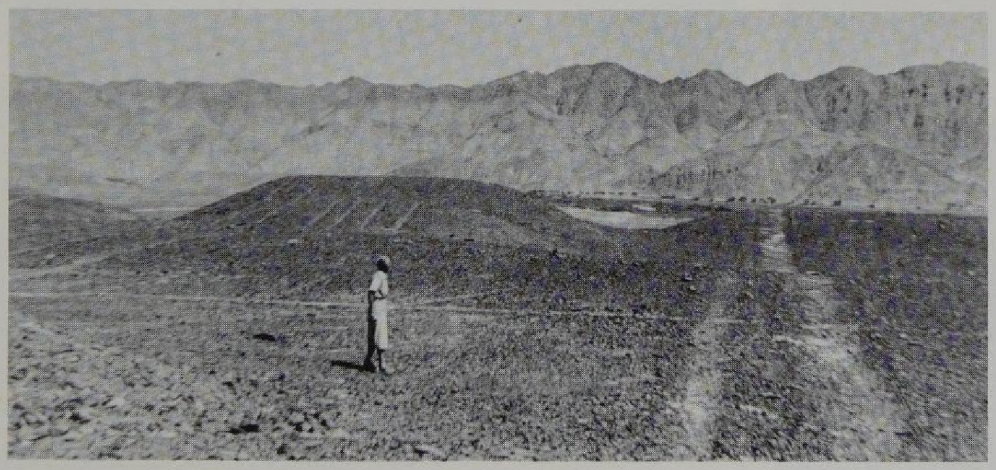
related to the convolvulus and morning glory, is widespread throughout the American tropics where it has long been cultivated for its tubers. The pale lilac variety became Maria's favourite. Similarly, of the two kinds of maize that the farmers gave her, Maria preferred the darker variety known as *morado,* or purple maize, which was praised by everyone in the valley for its medicinal properties. According to the older ladies of Ingenio, who were the local herb specialists, the darker maize was an exceptional tonic and reduced blood pressure.

By this time Maria was forty-seven and conscious of the passing years, so her preoccupation with her health and her diet was natural if she was to maintain the fitness demanded by her rigorous life. In fact, she remained remarkably healthy during her time in the desert, apart from a bout of malaria which luckily was short lived. 'I cured myself with brown beer', she once explained, 'You boil the beer until it is concentrated to half the volume and take several gulps every day'. The attack lasted only a few days but was enough to weaken her and remind her that she was alone and vulnerable in the desert. But in every other way she thrived on the outdoor life, becoming so tanned that she often went unrecognised. Apart from her height (she is almost six feet tall), she could have been taken as a farmworker from the valley.

Maria Reiche hiked across miles of barren desert.

When not in her desert hideaway at Ingenio, Maria continued to work for Amy in Lima looking after the accounts of her expanding property business and teaching or translating in her spare moments. Otherwise she was occupied with Nasca research. She was in touch by letter with Rolf Müller, the astronomer who had studied the Cuzco temples, and she began to look for academic funds from overseas to underwrite her scientific endeavours. But she found it to be the proverbial 'chicken and egg' affair, with the academics needing more information than she could provide before they would promise support.

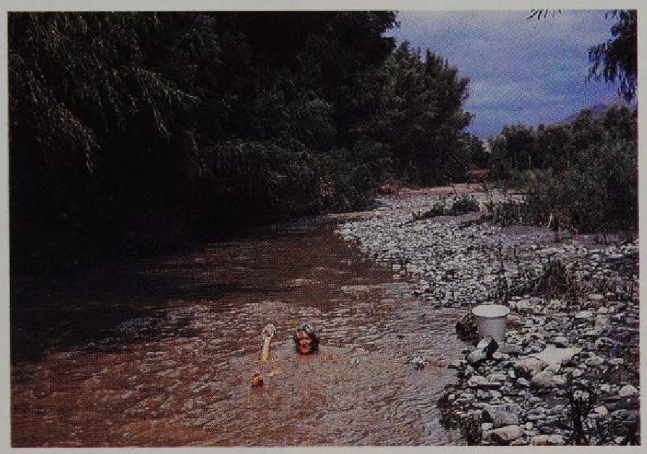
In 1952, however, an American, John Alden Mason, Curator Emeritus of

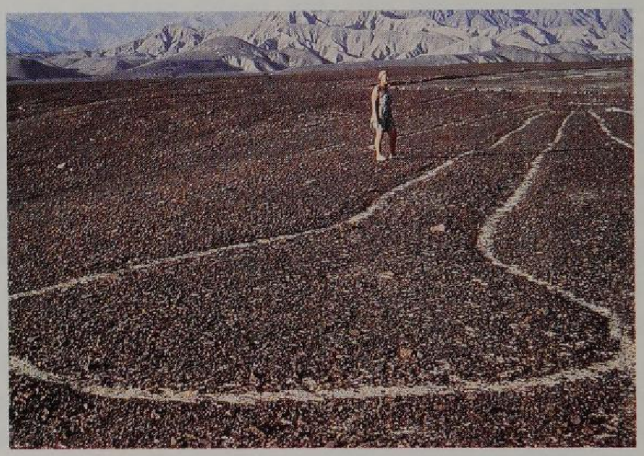


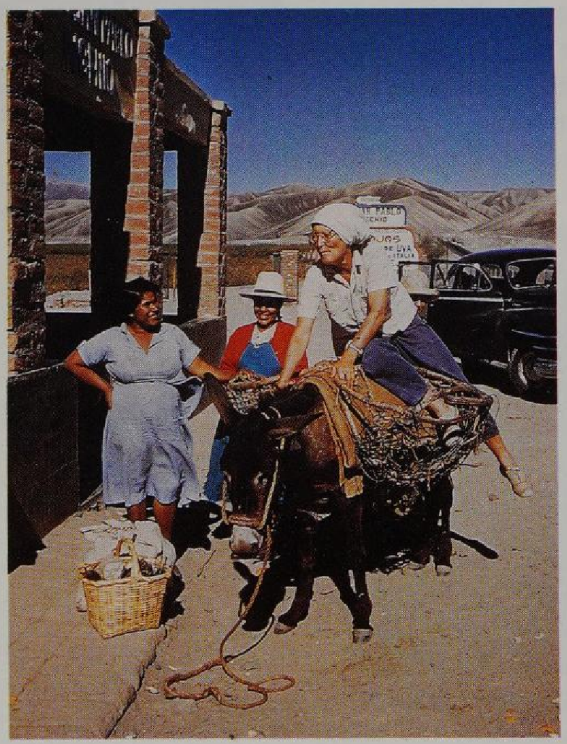
In the 1950s the skyline was perfectly clear so that stars could be seen against the horizon. Maria Reiche stands near lines leading towards notches in the horizon.

One of the first colour pictures of the lines was taken in 1954 by Maria Reiche who brushed this figure of a bird to 'brighten it for photography'.

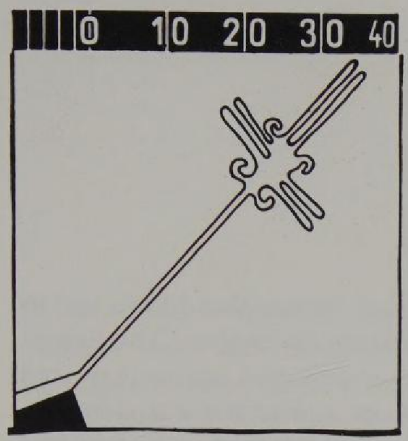
This curious plant-like figure is near the giant rectangle on the pampa of San José. Maria Reiche took the picture in 1954.

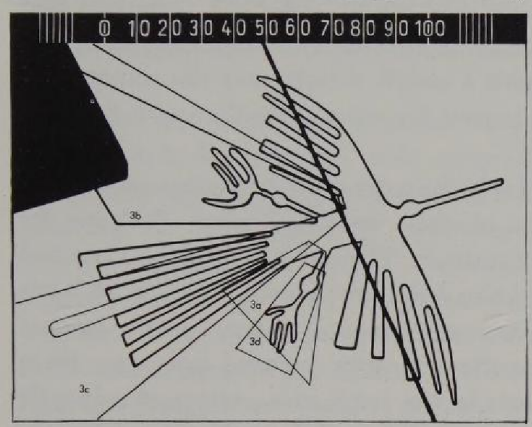




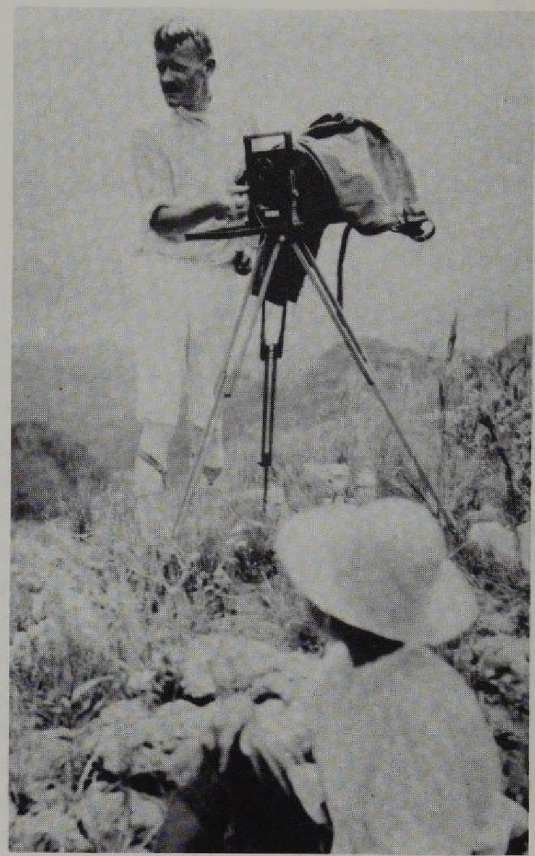


In 1961 Renate Reiche visited Maria. In Nasca Maria bathes in the Ingenio river (centre left), Renate stands near the figure of a bird (centre right). Above, Maria (photographed by Renate) on a prominent hill surrounded by lines, and (left) Maria amuses her friends at the San Pablo storehouse.





Maria Reiche spent months plotting these and other figures. Each one was drawn to a scale in metres, and published in Germany. Photographie und Forschung.

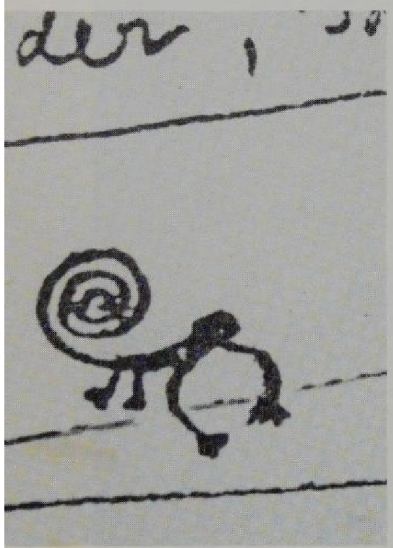


John Alden Mason.

the University of Pennsylvania Museum, visited Peru. Then sixty-seven he had already spent many years encouraging young Americans to study the rich South American past, which he regarded as 'as a wide open specialty'. During his journey, supported by the New York-based Wenner Gren Foundation for Anthropological Research, Alden Mason collected a wealth of information which he later published in his now-classic book *Ancient Civilisations of Peru*. He visited Nasca and described the lines, giving some credence to the idea of the desert calendar. He noted, however, that 'the latest report from Miss Maria Reiche is to the effect that, from one centre 10 feet square, 23 straight lines radiate . . . most of them are 595 feet long . . . another frequent measurement . . . is 85 feet'. Although there is some doubt about these actual measurements, Alden Mason acknowledged Maria's developing theory that the lines appeared to be based on a known unit of measurement.

In Maria's view the line builders had carried their unit from place to place. 'Just like the ancient yard or foot . . . the Nascas had a standard measurement, so the widths of lines are similar even when they are far apart'. This unit was to absorb her concentration for the remainder of her days on the pampa, and the early recognition accorded her by Alden Mason left its mark. Maria has always been deeply grateful for his comments which set her on the road to international recognition.

The first breakthrough on the San José pampa also came in 1952, just before the feast day of Saint Joseph in March. 'It was my happiest moment and I began jumping with excitement', Maria remembers. 'I was alone and not far from the great rectangle when I found the monkey'. The predestination surrounding her life seemed to be limitless. 'I believe it was the turning point in my work. It gave me so many new clues'. The markings on the desert were



A sketch of the monkey figure in a letter Maria Reiche sent to Germany in March 1952.

Maria Reiche marking stones which she believes were used by the artists to plot the drawings.

extremely faint and the curving line of the figure so narrow that Maria had to place one foot gently in front of the other to inch along the outline. The figures are difficult to see unless the dust and fine gravel of past dust storms is cleared away, and to expose the nature of the design Maria scuffed her feet along the narrow outline until she reached the end and could look back. The line had been drawn in one continuous sweep on a flat surface, but before she could see the full extent of her find she had to plot a rough sketch, and she remembers her growing excitement as her pencil traced the sinuous outline of a monkey with a tightly spiralled tail.

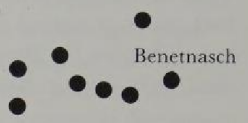
The discovery of this figure gave Maria the edge over her competition and she kept it secret until she had time to consider its significance. Perhaps the most puzzling aspect was the choice of animal. The ancient Nasca artists had embellished their ceramics with many animal designs, mostly taken from birds and beasts seen in the valleys. Foxes, humming-birds, snakes, lizards, spiders of many shapes and sizes run across the countless painted pots dug from graves. Nasca artists found their colours in the earth in a variety of minerals which they powdered and mixed with water or possibly with plant juices to make a paste.

With the sea not far away the Nasca artists also chose to portray some shore life, including pelicans and a variety of fish and whales embellished with curious eyes and heads. But monkeys were unknown in the Nasca valley. So how did the near perfect outline of a monkey come to grace the pampa? The nearest places where monkeys can be seen these days are in the valleys crossing the northern coastal desert of Peru, or in the Amazon forests on the other side of the Andes mountains. There is no easy answer to the question. Possibly the Nasca people were visited by traders or perhaps the Nascas themselves travelled to distant parts.

Maria was unconcerned at the time with the origin of the monkey; her thoughts were with the methods used by the artists to plot each creature so accurately. In her mind the answer lay in mathematics and the newly discovered 'Nasca unit', though precisely how this had been employed or even rationalised by the Nascas was another problem.

Using an idea that had been growing in her mind since the 1940s, Maria searched around the monkey looking for stones which for one reason or another seemed out of place. They may have been pieces introduced from other parts of the desert or simply moved into special positions by the line builders because they were unusually coloured or shaped. Maria considered these odd stones as markers and she pinpointed them with short sticks. Once she had identified all the marker stones, she linked them with cotton or string. By pulling each length tightly across the figure, she discovered that the designers could have created the monkey within two triangles. From head to tail the monkey measured 260 feet. Adjoining the figure Maria found a long cleared patch which she called a *pista,* literally a track or court. This pista was

crossed sixteen times by one continuous line traced back and forth by the builders, until after the final crossing they had directed it as a straight line through one sharp angle to rejoin the beginning of the pista. Maria found she could follow the line into the centre of the tail spiral and out again. 'I found that it made an endless pathway', she has said. The dancers envisaged by Hans Horkheimer would have moved rhythmically as an unbroken chain around the figure.



Although historical records do not support her view, Maria believes that the people who drew the monkey saw its outline in these stars. The Greeks said they formed a bear.

Maria then turned her attention to astronomy. She wondered if the desert figures could be matched with patterns in the night sky. Through the ages people have looked to the constellations and identified them with earthly forms. Looking for a comparison with star patterns over Nasca's mountainous northern horizon in AD 1000 — as a likely time when the lines were drawn — Maria said that the form of a monkey could be seen in the sky made up from 'the stars of the Great Bear, Plekda, Megrez, Alith and Mizat forming the two arms'. More specifically Maria checked the compass angles of the straight lines near the drawing and noticed how the long pista pointed to the position of the star Benetnasch as it rose above the horizon 'in about the year AD 1000'. Benetnasch is at the tip of the tail or the handle of the Great Bear constellation. With the lines near the monkey aiming so clearly at an identifiable constellation Maria felt she was on safe ground in linking the monkey with ancient Nasca astronomy.

Before she had found the monkey, she had come across other animal figures such as the killer whale and the giant so-called 'condor' bird, but at that time she had considered them only as works of Nasca art. In this she was supported by commentators like Hans Horkheimer and Kosok who pointed out the similarities between the earth drawings on the desert and the rich art decorating Nasca pottery. But now Maria began to reconsider how these other animals could be related to the night sky of ancient Nasca. Could there be some hidden meaning drawn on the earth? Perhaps one far beyond even the most obvious possibility, as suggested by Horkheimer, that each animal was some family or clan symbol?

Throughout 1952 Maria continued to work on the pampa, breaking her studies only for short visits to Lima where she kept a small rented apartment. During her absences Maria let her rooms to visitors and the money helped with the field expenses, so on her visits to Lima she sometimes stayed with friends like the Cuzco-born novelist Clorinda Caller who she had met in the late 1930s.

Towards the end of the year Maria was looking ahead to receiving a camera from her sister, Renate. Her photography of the lines had been restricted because of cost and the inconvenience of borrowing equipment from friends. Renate, whose medical practice was expanding in Stuttgart, had a patient who was a director of Zeiss, the household name among photographic professionals. In return for producing publicity pictures for the company, Renate was promised a factory-new Zeiss Contax. Armed with her new camera, Maria

Victor von Hagen on the Inca highway through desert near Chala on the Pacific coast south west of Nasca.

expected better than ever pictures and looked to Peruvian Airforce friends to give her a helicopter flight over the lines.

News of her work, and particularly of the monkey, was reported in the national paper *El Comercio* and attracted more visitors to the pampa. Among them was Missouri born Victor von Hagen who, at forty-five, was one of the most prolific authors on South American topics. Von Hagen was a brilliant, witty and sometimes abrasive character. His lifework spanned the American tropics and he had already lived for some years in South America. Among his books were biographies and works on exploration and ethnography. The project he was undertaking in 1953 was his most ambitious. It was dedicated to walking and mapping the ancient Inca road system of Peru. Von Hagen had announced his 'Highway of the Sun Expedition' through the American Geographical Society the previous October: 'Mr von Hagen will direct an intensive two year study of a forgotten and almost incredible world, the thirteenth century highway of the ancient Incas'.

Victor von Hagen, with Sylvia his wife, in the Inca ruins of Machu Picchu.

The team of six set out to follow one of the grandest roads in the world. It once stretched for half the length of the Andes mountains and several times across the ranges. Von Hagen was accompanied by his Berlin-born Brazilian wife Sylvia who was an experienced textile artist. Among the other members of the party was Dorothy Menzel, a young archaeologist who has since achieved distinction for her studies of Nasca, Paracas and Ica pottery.

This powerful entourage set Lima agog and von Hagen busily reported to *The New York Times, Life* magazine and the press syndication group North American Newspaper Alliance. Aware of this vast network of publicity, Maria was perhaps understandably concerned that she would not receive full credit for her work. Roads and lines were distinguishable in her mind but she suspected they were not in the hands of such a fluent writer. So she was determined to publish before von Hagen and be first into print with modern pictures of the pampa.

But it was not to be. Von Hagen sent a story to *The New York Times* datelined

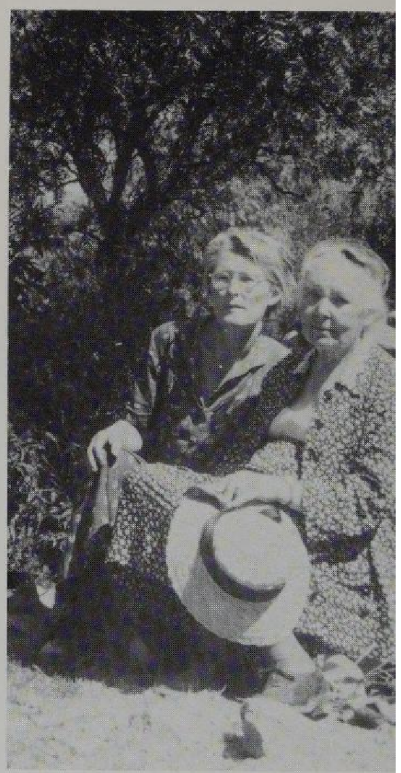
Dorothy Menzel on the right was an archaeologist with the Highway of the Sun Expedition and has since become known for her expert knowledge of Nasca and Ica pottery. Richard Lawrence was the cameraman and Francis Riddell (left) archaeologist.

'Ingenio, March 1954: — Pre-Incas were First in Modernist Art. ''We followed the prehistoric Inca road over the Nasca valley and it led us to a modern art exhibit'' '. Von Hagen, who flew over the lines, said the figures etched on the pampa 'could have been the tortured drawings of Salvador Dali'. He described many of the lines and figures: 'Then we came across a bird (was it an eagle or a humming-bird?) more than five hundred feet long', and he concluded by saying that 'one woman, Fräulein Maria Reiche, has given five years of her time tracing them out without coming to any definite conclusions'. Significantly, however, von Hagen did not mention the monkey, nor did he refer to Maria's most recent theories.

Soon after von Hagen began his 'Highway Expedition', Maria's seventy-nine year old mother, Elli, arrived in Peru. She had decided that, as Maria looked set to stay in Peru for ever, she would have to go to South America if she wanted to see her daughter again. The indomitable Elli arrived by sea after a three week journey travelling third class, and the reunion between mother and daughter after seventeen years was memorable. Lima was covered by winter fog and Maria had to look after her ageing mother in a chill apartment. To find the sun they travelled by bus to Nasca and then high into the Andes behind Lima. Elli enjoyed the experience even if, at times, her age exasperated Maria. But Elli had spirit. In Huancayo, a mountain town where, between the high ranges, the thin air leaves most visitors breathless, Elli kept pace with Maria, decided she liked Peru and planned to come back some day.

After Elli had returned to Germany, Maria continued her search for figures on the pampa. She found the pelican, a curiously styled bird figure, and experimented by using a broom to clean its outline. The palm fibre brooms which she bought in the local market never lasted more than a few weeks' hard brushing, and Maria was always calling at the same stalls to replace her stock. 'The people had no idea why I wanted so many brooms', Maria tells her friends. 'I always came out of the desert as brown as a witch and bought even more brooms — the villagers were afraid at times, but I never disillusioned them. It kept them off the pampa'.

In January 1955 Zeiss published Maria's story of the lines in the company magazine. It was her first major international appearance in print and both colour and black and white pictures set a new standard by revealing even more



Elli and Maria Reiche in the mountains near Lima. They had not seen each other for seventeen years.

The pictures on these pages were taken by Maria Reiche with a Contax IIA camera. Many were published in colour in Photographie und Forschung: The Contax in the Service of Science *and form a permanent record of Maria Reiche's early work. Unfortunately the colour originals have been lost.*

'An accumulation of stone mounds'.

details of the lines. For the first time the true scale of the work could easily be understood. The long furrow-like markings lay clearly across the desert, their borders formed of low heaps of stones piled there by the ancient builders. Although not comparable with the immense Egyptian pyramids in terms of human effort, the Nasca markings were at once revealed as both extensive and complex. In her article Maria referred to the monkey and other figures and the method she used to plot them. 'The charts of the figures were made mostly by the use of radii. . .' She continued: 'The measuring tape was attached to a stake and pulled out from the centre in all directions. The large bird is 450 feet long from beak to the tip of the tail. It consists of a single continuous line about 27 inches wide which, if fully extended, would be about 1¼ miles'. Unlike her earlier more descriptive work in *Mystery on the Desert,* the contribution to the Zeiss magazine marks her first steps into describing the geometry of the figures.

Maria's brushing technique put many of the lines in a new perspective, giving them the contrast they would have enjoyed in their original state. Kosok had once tried scuffing the lines with his boots to give the same effect. 'He had *large* boots', Maria noted. Now the figures stood out clearly in her pictures. Many of the views were taken from the top of a seven foot aluminium ladder; at other times, to get a better view, she strode across the pampa on wooden stilts, a skill she had developed since 1948. With other pictures in the Zeiss magazine, Maria drew attention to the neatly arranged piles of stones accumulated in the apex of one of the triangular clearings — about 1,200 heaps altogether. She wrote: 'The triangular field is about 875 yards long and 87 yards wide at the base', but she never explained the mounds.

As she took this picture from a step ladder, Maria Reiche's shadow was cast across the spiral marking.

The Zeiss publication was circulated widely by Renate and Elli. They produced translations and arranged some specially bound offprints which were passed round to give Maria publicity; some were sold in Lima to help with the field expenses. As well as this exposure, Maria was put in touch with other German magazines including the highly illustrated *Quick* and the science magazine *Kosmos.* At last the European interest in the lines was beginning, and

Above left, a shallow depression near the Pan American Highway.

Above, hands of the monkey.

one reader wrote to Renate suggesting that they might have connections with Martians or act as landing strips for space craft — echoing, without knowing it, the comments of people in Nasca interviewed ten years earlier by Hans Horkheimer.

More encouraging to the Reiche family was the interest from specialists in Germany. Maria was in contact by letter with Professor Hermann Trimborn in Bonn and the writer-archaeologist Dr Hans Disselhof who, in his book *Oasis Towns and Magic Stones in the Land of the Incas,* described Maria as 'a solitary heroine of science'. Maria corresponded at length with a German engineer, Paul Stephan, who became her mentor on many technical matters and there was talk of a small research grant from a German foundation for young scientists. It did not matter that Maria was over fifty; her work was excitingly fresh. At the same time her dedication was obvious and even without a conclusion, editors and academics admired her dogged enthusiasm.

In Peru Maria was preoccupied with preparations for her long-anticipated helicopter flight. After many months, she had eventually persuaded the Peruvian Airforce to take her over the lines. Strapped to a supporting strut

Below left, Maria said this is a 'pathway 1.2 metres wide, extending for 180 metres'.

Below, part of the so-called paddle wheel.

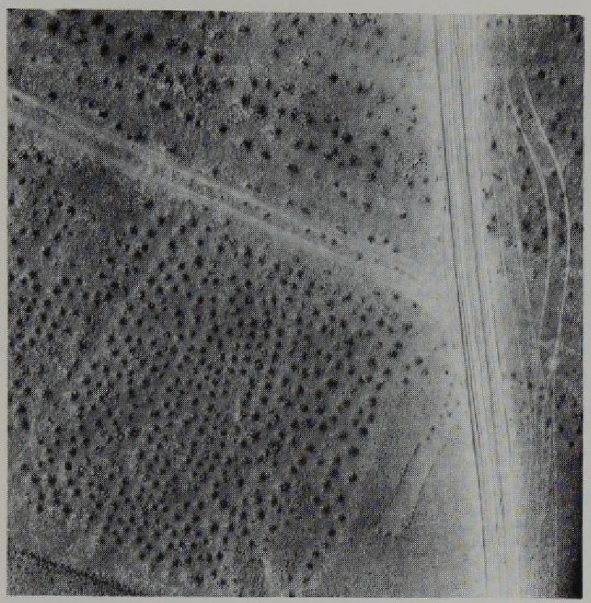
Maria in 1955 at the time of the helicopter flight. Strapped to a supporting strut she took the photographs on this and the opposite page.

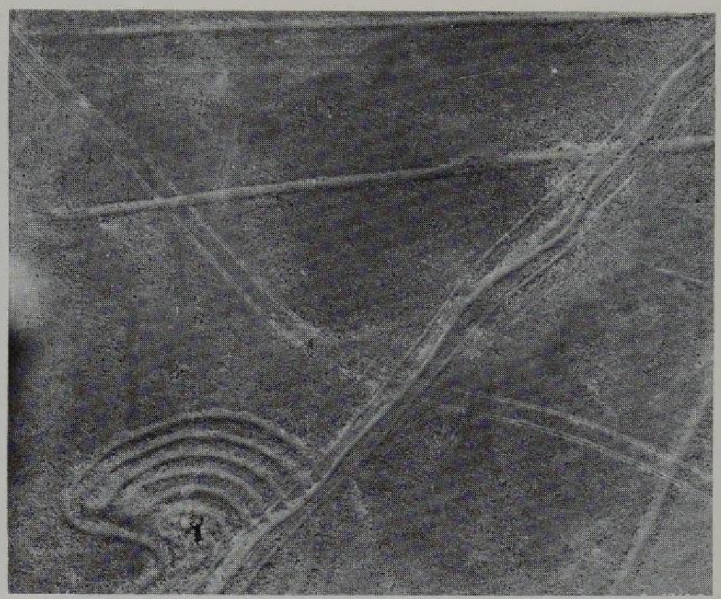
outside the machine Maria clutched a heavy special aerial camera provided by her Airforce friends. 'I have never been afraid of flying', she says and, even now, goes aloft in any aircraft at every opportunity. 'That helicopter flight was wonderful', and she gleams with excitement at the memory of hovering above the figures. She photographed 'her monkey', the bird with the serpentine neck, a fish and some triangles — altogether about fifty features. 'Flying is the only way you can see the full beauty of the figures'. Maria was the first person to make this comment, though it has been repeated many times since.

It was only a short time after that memorable flight in mid-1955 that Maria found herself drawn into a political controversy, one that not only filled the local papers, but also the national press and, later, magazines worldwide.

One afternoon early in August, she arrived in Ingenio by bus to find the pampa marked by long rows of wooden stakes. These had apparently been put there as markers by workmen who, without any care for the fragile desert surface, had careered about in jeeps across the lines and figures. Car tracks and footprints were everywhere. When Maria asked the meaning of the sudden

Pictures from the flight. Below, a clearing with small heaps of stones. Below right, two wide lines meet the end of a large clearing.

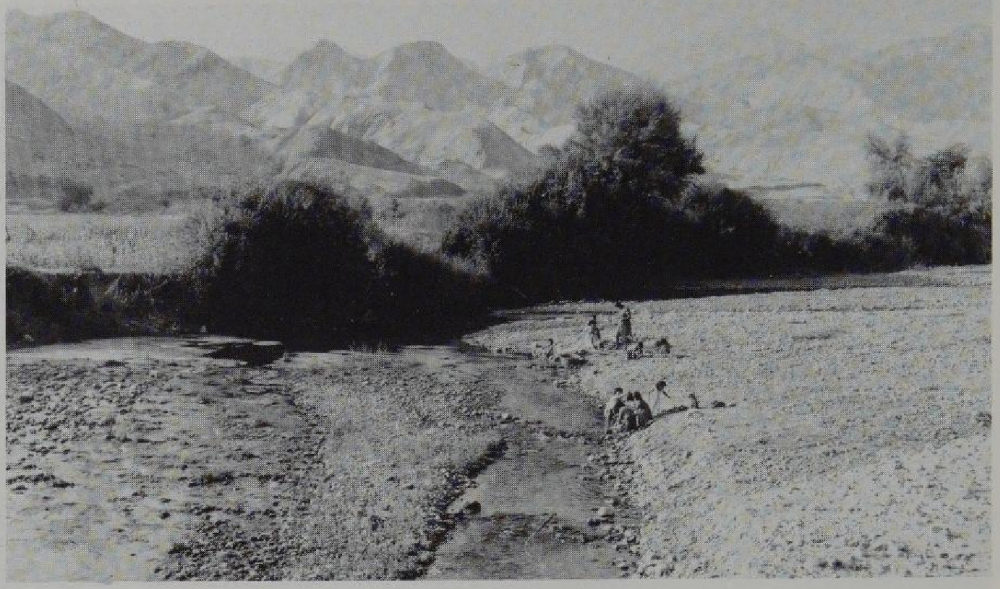




invasion, the storehouse caretaker simply replied 'the pampa is to be irrigated next year'. Maria was stunned but not speechless. 'They planned to irrigate 50,000 acres and all the backers were tied to the Government — I knew I had to stop them'.

The Rio Grande river has many tributaries including the Nasca and Ingenio. The largest water courses have cut valleys across the desert and

From the helicopter Maria Reiche saw over 1,200 heaps of stones in one clearing (above left), a spiral — with one of her helpers waving (above right), and (left) a curious starlike marking in a clearing. Many other marks are clearly identifiable as car tracks.



Local people wash their clothes in the Ingenio river.

provided naturally irrigated land which has been cultivated for centuries. When Spanish farmers settled the region after the Conquest, they divided the fertile land into traditional farms, often basing their holdings on boundaries agreed by the original inhabitants. The desert above the valley floor was viewed by the local landowners as a useless wilderness, more of a 'no man's land', which could be claimed. So they set out rows of stakes marking their rights, and delimiting the land they intended to irrigate.

Such irrigation schemes are the dream of many desert farmers. The river water in the valleys is often erratic and influenced by the annual rainy season high in the mountains, so a controlled, well-engineered supply, though initially expensive, has many advantages.

By 1955 the idea had become a costly and expensive project envisaging a tunnel high in the mountains to breach the continental divide. Water would flow from Amazon tributaries on the eastern side of the mountains, through the tunnel to the arid Pacific coast in the west. Ambitious though it may seem, such projects have been successful in Peru. And for Maria it was only too clear that setting a flood in motion would drown the pampa.

The Lima press and the Peruvian Airforce took up Maria's cause. After her flight, Maria staged a massive Nasca exhibition with the Air Photographic Service (SAN) using some 800 photographs of the 'desert calendar' as the markings were then called. The Airforce Commander, Alejandro Gamón, announced to a crowded press conference the total of pictures taken to date: 180 by 1947, 500 in 1951, another 180 in 1955. In her reply Maria 'cordially expressed her thanks to the Service and announced her intention to continue her research'. Newspaper readers were drawn into the affair, the exhibition was packed and the publicity continued, while Maria's attack on the irrigators became a sensational story which the editors kept on their pages for weeks.

Much of the battle was fought in the Lima press in September 1955 when landowners and politicians opposing Maria cast sharp doubts on the value of the desert markings and her work. Some of Maria's antagonists were loath to admit that the original, supposedly primitive, inhabitants of Nasca possessed any form of culture and were quick to dispose of the astronomy hypothesis. The letter columns soon filled with allegations from senators and deputies backing the irrigation project. Maria replied valiantly by attempting to explain

the philosophical and practical complexities, the significance of straight lines, animal figures, the heavens and astronomy, all heady ideas in those early preconservation days. Many of her supporters were unable to understand her explanations, yet everyone on her side agreed on one point: the lines were mysterious and should be saved. An old proposal was renewed that a national archaeological monument should be created along the southern border of the Ingenio valley, the pampa of San José being cited as the most important place.

Maria explains some of the finer points of her work to government officials in 1955.

Maria tried to generate interest in the proposal in Germany and despatched newspaper clippings and translations to Renate and Elli. Perhaps the German press might draw world attention to the need for a conservation plan. But such rearguard action proved unnecessary for by the middle of September the controversy reached the Peruvian Chamber of Deputies. A number of politicans, sensing they were losing popular support, changed sides to back Maria, cancelling the concession of the land developers and calling for the trial of the Director of Irrigation. Government officials visited Nasca and on 15 September, 1955, the order was given to suspend the work. 'Work Threatening Nasca Observatory Stopped' read a triumphant *El Comercio* headline. Everyone agreed it was a typically shady Peruvian political story and Maria, an innocent in the middle, won huge acclaim. The American news magazine *Time* devoted half a page to the events aptly titled 'Of Time and Water' and included pictures of Maria and the monkey.

EL COMERCIO.—LIMA, VIERNES 16 DE SETIEMBRE DE 1955

Suspendieron el trabajo que amenazaba Observatorio Nazca

Ministerio de Fomento ordenó paralizar las obras de irrigación que afectarían a milenario y gigantesco observatorio astronómico

Page from El Comercio *of 16 September, 1955.*

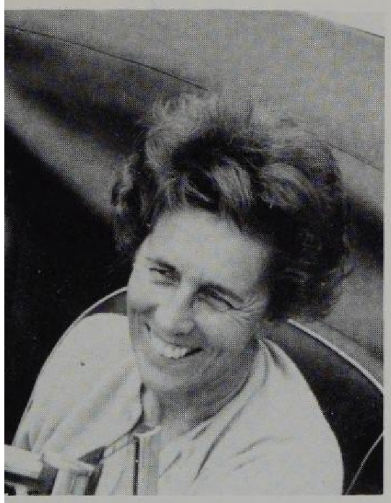
And while the final scenes of the drama were being played in Lima, Maria returned to the pampa, announcing she was prepared to spend the rest of her life working in the desert.

The next four years were marked by change. Maria, getting older, became concerned with other areas of Indian craft and history. On several occasions she returned to Lima to give lectures and became drawn into the capital's nascent cultural and artistic society. One of her passionate interests was the artistry of the early ceramic artists. Could they have concealed messages, measurements or even a clue to the lines in their patterns? Inca or early Peruvian writing has never been found, though many enthusiasts have speculated that the designs were used as a way of communicating. Kosok had once talked of this idea with Maria, pointing to the sequences of patterns in some Nasca textiles found perfectly preserved in graves. The rows of designs

— perhaps tiny demons — were set out with a clear preference for numbers which Kosok felt must be connected with the calendar.

Within her group of friends Maria became a fount of knowledge, particularly on alternative medicine, and she was frequently asked for advice. Contemporary followers of the North American Cultural Institute remember her well and at one informal gathering in the Pension Los Incas, set in the tranquil olive grove of a Lima suburb, Maria revealed her secret treatments. 'Doctors are too expensive', she said. 'I try to keep away from them'. For treating sciatica, which continued to affect her, she recommended drinking the brown beer concentrate. As a cure for jaundice she suggested the bitter juice pressed from orange pips, and on one occasion Maria produced some pink desert Tessaria, a relative of the daisy, with its leaves to ease asthma.

When Maria was in town the word was soon passed around with the news that 'The lady from the desert who lives on oranges is here'. At the newly formed 'Art Center' she found many friends, although Norah Scott, a talented painter from Argentina, and her daughter Jo remember her out-of-town clothes and style which set her apart. 'Often she would sit quietly, keeping away from the general chatter until someone asked a question about her work. Then her face sparkled and her real enthusiasm came through'.



Norah Scott, an artist, who remembers Maria Reiche's passionate interest in Indian medicine.

Some of these soirées were arranged in Maria's honour and to introduce her to visiting personalities. In February 1957 she arrived from the pampa to attend a British cocktail party in Lima to meet Jacquetta Hawkes, the archaeologist wife of J B Priestley, who had worked for UNESCO and was compiling a history of mankind. Seeking support and a kindred enthusiasm, Maria tried to persuade her to fly over the lines and Jacquetta Hawkes has always regretted that she did not take up the offer.

At this time Maria's energy was directed to developing her latest theories concerning measurements. But her research was interrupted when she learnt that Amy was seriously ill, and she returned to the capital to be beside her old friend. After such a long and close relationship, Maria was caught up in the depression surrounding Amy. She found herself torn between the fascination of the desert lines and her duty as a companion. Whenever possible, she escaped from Lima and headed to the pampa where the solitude offered her modest relief. She always felt better there, more in touch with the real world, and it was there that she experienced a curious premonition.

Someone was there with her, yet the desert was empty. 'I couldn't understand it — most curious', said Maria. Shortly afterwards she heard from Renate that their mother, Elli, had died. The sisters were now alone on different sides of the world.

The next years were not her happiest and her greatest plans and hopes had to be pushed into second place. Amy's illness was confirmed as cancer and Maria found she could barely leave her longtime friend whose progressive illness tied her to Lima. But she seldom lost sight of her goal, and between

comforting and helping Amy, Maria remained optimistic about finding a solution to the Nasca riddle. She wrote for German magazines and sought help from astronomers until, at last, financial assistance and students who would work beside her were promised from Germany.

Nevertheless, work on the pampa was incomplete, and the news from Nasca was not good either for the virgin desert was being damaged by local development. The highway south was being improved by road builders who moved their vehicles across the pampa and along previously insignificant tracks which they widened. On one occasion some local army recruits held a training exercise on some of the finest lines, and the first tourists began to trail across the unguarded site. At least one local family chose the great rectangle as a picnic spot.

Maria's definitive account of the monkey and her interpretation of its astronomy was published in Lima in 1958. In the same journal Father Rossel Castro also wrote a full account of the lines. He mentioned Maria only briefly in connection with Kosok's work, but failed to give her any recognition in his page-long account of Nasca astronomy. The competition to be in the public eye had resurfaced.

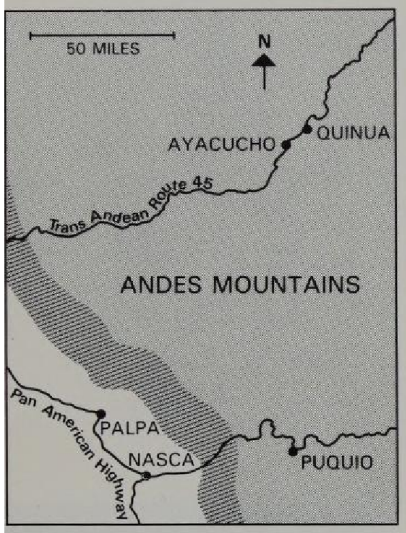
During 1959 both *El Comercio* and *La Prensa* continued to support Maria. Jorgé Recarraven, a locally famous correspondent, writing in *La Prensa,* recalled Maria's love of Peru saying she was a great 'Peruvianist', and the paper's cartoonist portrayed an already deeply-lined and serious face. But less than three weeks later *The New York Times* gave another story: 'Lima, Peru, 20 June: Tracings in Peru Called a Calendar — a woman's view on drawings of ancient Indians is disputed by many'. After a preamble describing the markings, the writer asserted 'it is generally accepted that the drawings are an artistic and doubtless ceremonial expression of Nasca culture of about AD 500'. Far from supporting Maria's view that the lines represented a vast astronomical observatory and calendar, the mysterious Lima correspondent claimed that 'many archaeologists here are reluctant to accept this interpretation'. After so many years work it was a bitter blow.

To make matters worse, news reached Lima of Paul Kosok's untimely death. He was known to have been in a 'nervous and agitated state' for some time before he died, and Maria realised his book was unfinished and some way from publication, so the future of Nasca could be in her hands. But at what cost? Her health was suffering and the pampa she loved was under attack. Then, as summer approached, Amy's condition worsened. The two ladies travelled briefly to Ingenio where Maria hoped the climate would be good for her old friend, but there was no chance. The cancer had gone too far. Amy returned to Lima for the last time and died with Maria by her side.

Amy's struggle had been courageous and through even the darkest moments she was persuading Maria to write the book of the lines. Maria, then almost sixty, promised to complete the story.

CHAPTER 5

Spacemen and Other Visitors



Maria had gone from Nasca by 1960. With five colleagues I called there on the last stage of a year-long study tour on the way to Cuzco and its Inca land. In Lima we had stayed at Norah Scott's pension and heard of Maria through night long parleying with resident artists and writers. A well-thumbed paperback of Alden Mason's book was our guide.

We travelled south along the Pan American highway through Ica, stopping at a simple roadside stall to enquire about Maria. 'The *profesora* is away in the mountains; she's not been seen for almost a year', we were told. 'You must look for her at the San Pablo storehouse'. But it was locked. Maria had slipped away without saying much. Everyone was helpful because Maria was known as a schoolteacher who had 'friends' from Lima, foreigners like ourselves. But mystery surrounded her work and whereabouts, leaving us discontented with hearsay. I marked the pampa in my diary for a later visit.

Maria had been deeply saddened by Amy's death. The funeral at the formal British Cemetery in Lima saw the gathering of some twenty of Maria's closest friends, including Clorinda. As they stood by the grave, all in cool summer clothes and listening to a recording of Beethoven's fifth symphony, each one was conscious of the years they had known Amy. Born in London, she was sixty-eight when she died. For Maria the moment was harder than for the others. She was alone and had been away from her work for the best part of two years. Now free she felt it was time for a change but she could not face the desert and its solitude. Her choice was predetermined, for she had always felt at home in the Peruvian 'sierras', where in the valleys most days were like a perpetual European spring. Thus in the middle of 1960 she turned to teaching at a village school in the Andes mountains.

The Government of President Manuel Prado was under pressure to help the large Indian population. Already Lima was surrounded by shanty towns as poorly fed Quechua-speaking descendants of the Incas flocked to the city and with each day more people arrived by bus or truck in a desperate quest for work. Suddenly the problem was news. Prado's Education Ministry turned to

Quechua Indians from Chinchero, near Cuzco, preparing the potato crop to make chuno *— by freezing and drying, the potato can be preserved for many months.*

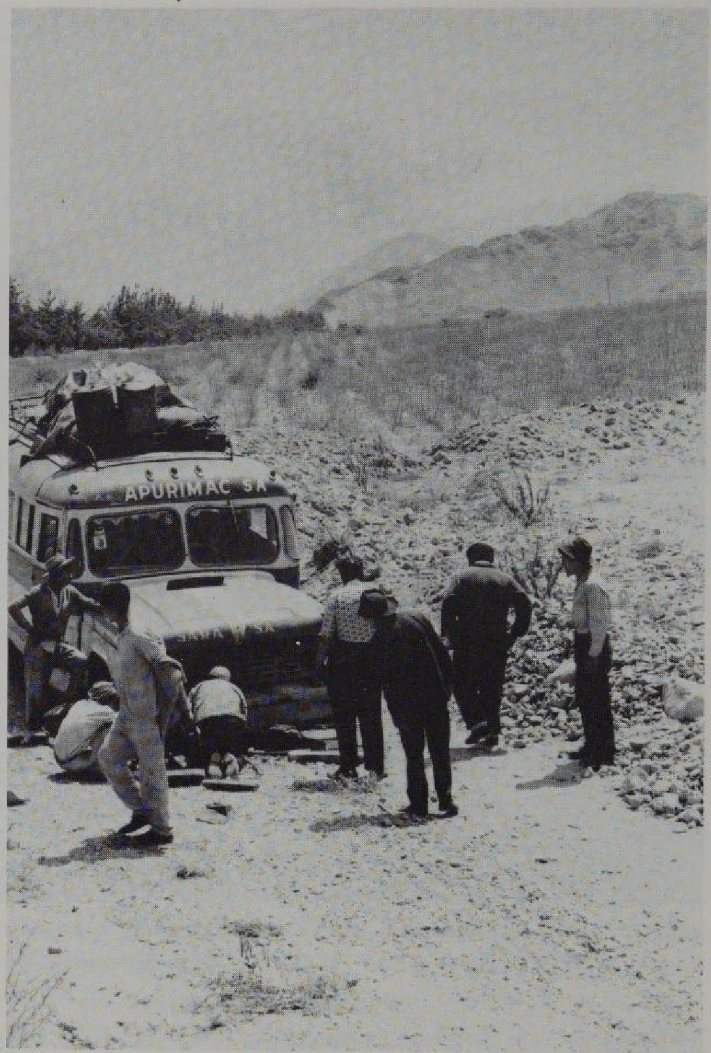
a politically useful literacy campaign aimed at rural villages where few Indians understood Spanish and even less could read or write. These Indians, clad in crude homespun clothes, lived a simple dawn to dusk existence with strongly traditional roots. Friends in Lima remember how Maria was elated when offered work; she had studied teaching in Hamburg and looked to a new challenge among the poorer people of the Andes.

She was sent, expenses paid, to Ayacucho in the mountains some two hundred miles from Nasca and one of the most historic cities in South America. By one of the coincidences that Maria began to expect, she found herself in Moya, a small rural community with a handful of simply thatched homes near Quinua, a town about twenty miles from the city.

Quinua was the site of the final battle for the independence of South America from Spain. General Antonio José de Sucre, beside whose statue near Amy's apartment Maria had sat many times, commanded the victorious army on the narrow plain outside the town on 9 December, 1824. The twenty-nine year old Sucre, born on the shores of the Caribbean in what is now Venezuela, was commanded by Simón Bolívar, 'the Liberator', to defeat the armies remaining loyal to the King in Spain. After the battle, Sucre wrote: 'The war is ended. The freedom of Peru is complete'. As she taught Spanish to the impoverished Indians, Maria had plenty of time to reflect on the hopes Bolivar had for a united and progressive South America, and what had failed to materialise in 136 years of independence from Spain.

Antonio José de Sucre, victorious at the Battle of Ayacucho.

Maria spent some months in a remote mountain village near Ayacucho.



The hazardous road to Ayacucho.

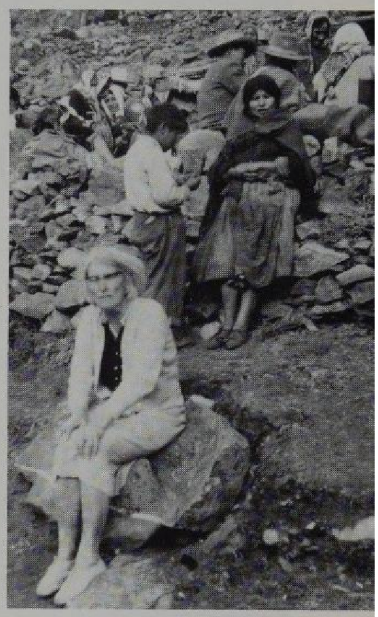
The mountain people are proud of their ancestry but have remained desperately poor, living in much the same way as they have for centuries. Maria knew that half the children in Moya died before they were twelve months old, and for those who survived domestic duties came before education. The coppery-cheeked youngsters either worked on the land or helped to look after their younger brothers or sisters until, at twelve or thirteen, they started their own families. A few very wealthy landlords still owned the land in the 1960s and the Indians were simply part of an estate. Tiny one-roomed houses of adobe mud-brick thatched with coarse grass were homes for families of ten or more. Fires set on the dirt floors wafted pungent smoke through the thatch when at sunset the doors were pulled firmly shut. Outside, the chill blackness was filled with spirits of the night running wildly in the Indian mind. 'The sunrise was always a wonderful moment', Maria remembers. 'The sudden warmth of the sun as it came over the mountains — what a miracle it must have been to those people!'

The social problems were one of the most painful aspects of her new life and

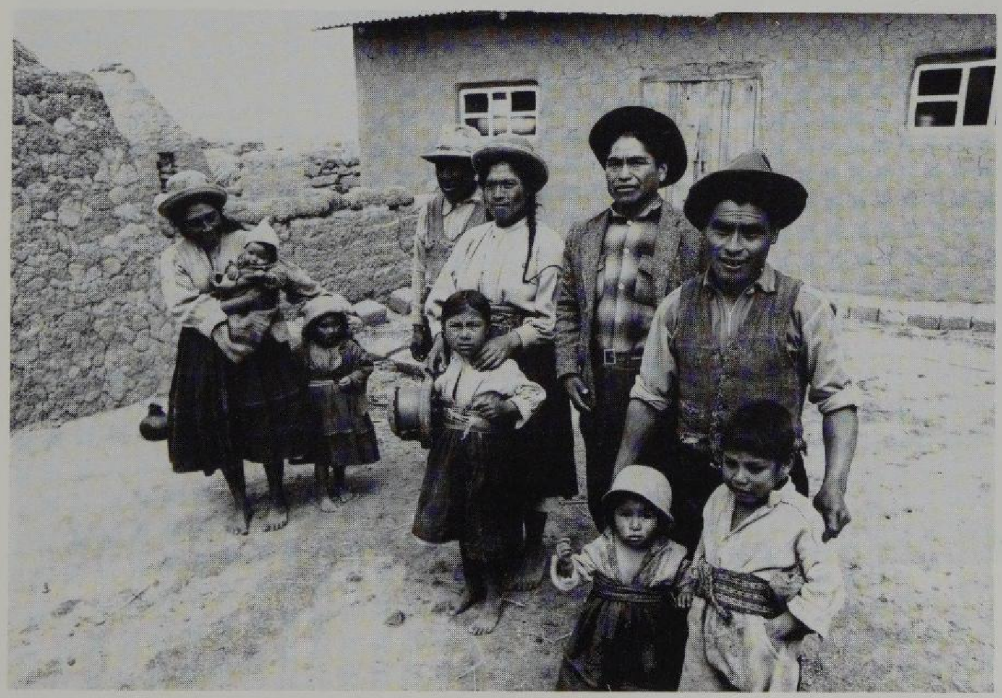
she threw her energies into her job making many Indian friends, mostly farmers who went barefoot to the fields. Among these Indians Maria found an extraordinary trust. The English column in *La Prensa* interviewed her in March 1961. 'Now at least I feel I have penetrated into the heart of Peru and the Peruvians'. She was 'greatly encouraged', she said, 'by her contact with the poorest of the poor. . . young shepherd girls who have never seen a book in their lives come to learn — they are extremely intelligent. I think more so than the girls in the cities who have been given benefits'.

Moya gave Maria the chance to put a fresh perspective to her life. In the interview she was again critical of her own beginnings which sent her to Peru. She had been away from Germany for almost thirty years. 'I was dissatisfied with my country, with my people, with my life — with everything'. Her future lay in Peru and its Indians. 'They had so many things I wanted to know. Their medicines — all native from the land around them — and their awe of the sun, stars and moon'. She has often wondered how the Indian calendar, tied to the agricultural year, could have been linked with the ancient use of the lines. Her days in Moya, though spent with Amy's death still tragically close, were an essential step in her reasoning. 'My predestination again', she believes.

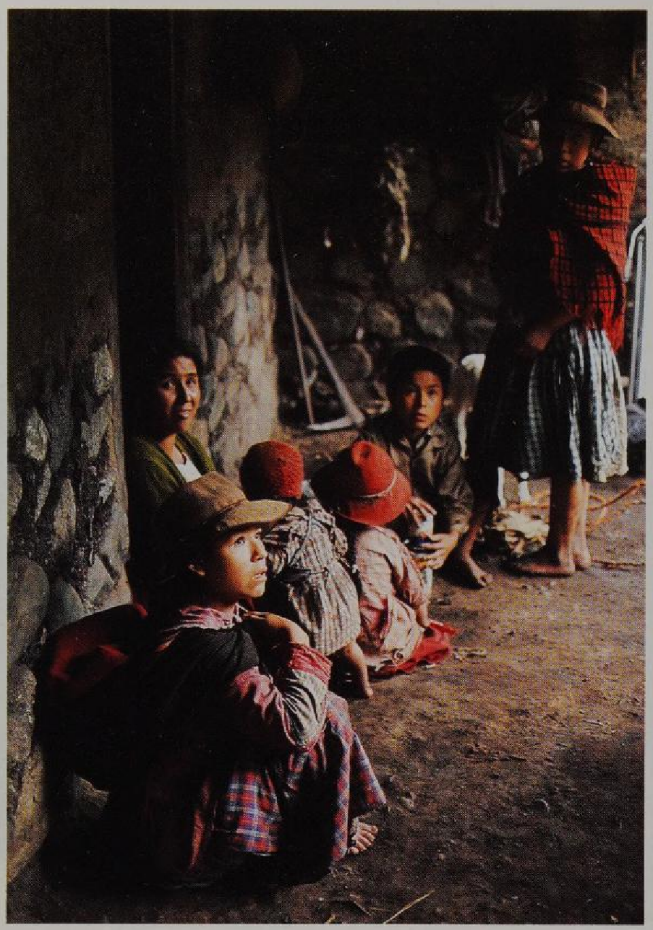
Maria put all her energies into Moya. One friend in Lima, Yonah Ibn Aharon, a twenty-one year old rabbi and New Yorker of Ethopian descent, encouraged her and she began to write a book. Not about Nasca, but a textbook which she hoped the Government would publish for low cost distribution to the Indians. 'They are proud', she said, 'and will appreciate the



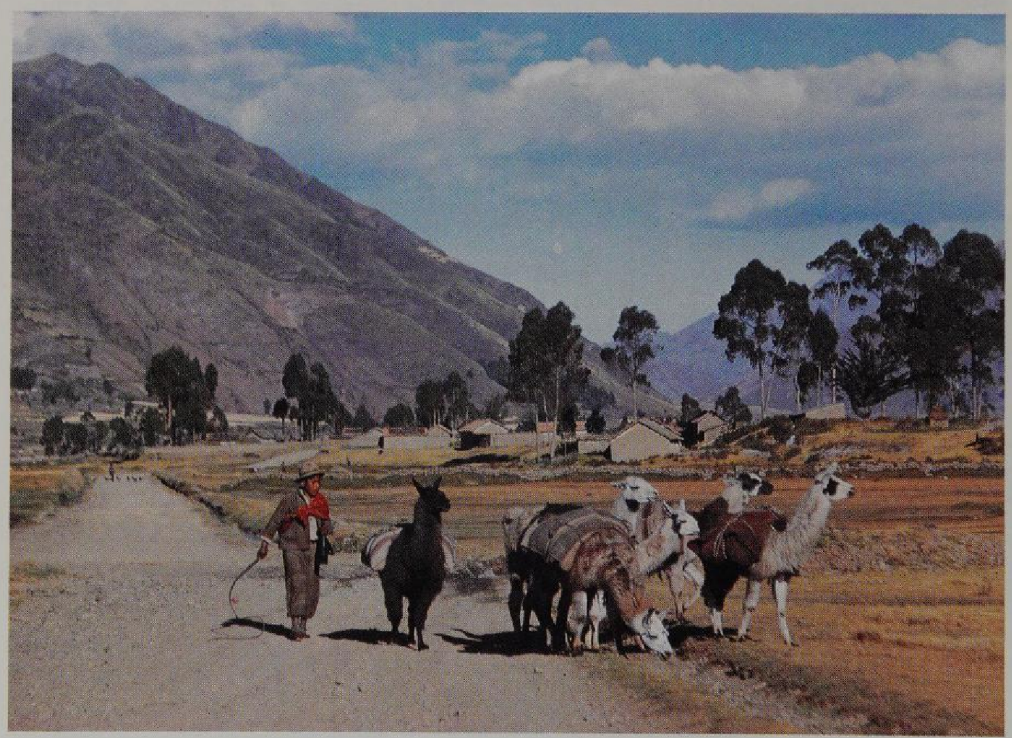
Maria amongst Quechua Indians in Moya.



Children are a vital part of the Quechua family. Although schooling is now compulsory, many children work long days in the fields.



Above, family life is the keystone of survival in a harsh environment. Above right, Andean Indian religion involves a complex mixing of old and new faiths.



Maria in Moya — a picture by Renate Reiche.

Left and above, life in the sierras of Peru has seen little change since the days of the Spanish conquest.

Renate Reiche sits on a mound at a starlike centre, first recognised as a Nasca feature by Maria.

book more if they have purchased it'. But she could not finish with Nasca and the Lima press still regarded her as the lady of the lines. *La Prensa,* remembering her spartan life in San Pablo, reported the theft of her aluminium ladder from the storehouse, and how subsequently Maria had spotted some shiny, lightweight fifteen foot ladders in a local shop. The column went on: 'She hopes the Casa Weiss will let her borrow one, as for her it will be like having a stairstep to heaven'.

Renate, knowing of her sister's dilemma, travelled by air to Lima in April 1961. For Maria to continue at Nasca meant a new approach; she had the determination but needed persuasion. Renate, who realised that her sister's health was at risk, bought an old Volkswagen — the early, popular 'beetle' model. For two months the sisters used the VW to travel across much of southern Peru visiting many places new to Maria. From Cuzco they drove almost 15,000 feet down a precipitous road to the edge of the Amazon. On the way they descended from snow-covered peaks into a realm of cloud-filled jungle canyons at the unprotected roadside; no mere day trip for two ladies approaching sixty.

Throughout this long journey Maria learnt to drive, eventually passing her test some months later. The experience gave her the confidence to continue with her Nasca exploration and Renate returned to Stuttgart.

By the time we first met, in February 1963, Maria was fifty-nine and had been settled again on the pampa for almost a year; she had changed the VW for a blue Chevrolet pick-up wagon complete with a canvas back.

With Nasca very much in mind, I had returned to the desert to direct a television film for the BBC — it was to become the first ever programme about Maria and the lines. From Lima I headed south with two friends, Allan Reditt, a journalist, and Mark Howell, one of the study group from two years before. At San Pablo we again found the storehouse locked and the caretaker just waved his hand in the general direction of the desert. We soon discovered that finding Maria Reiche in those days was virtually impossible as her new mobility allowed her to roam five hundred square miles of wilderness at will. Mark later wrote of our search and meeting after almost a week of fruitless tracking. 'We crossed the desert towards a small truck parked by two low hills and stopped. A stoutly built, pale, young man was sitting cross legged in the back, writing, and a grey haired lady slipped out of the cab and looked in our direction'.

With a Volkswagen and tent Maria Reiche explored distant corners of the desert.

We were beside the whale, close to the rim of the Nasca valley at Achaco where Maria had worked almost twenty years earlier. With the sun just a short time before its midday heat, the desert camp was quiet. Could this gaunt woman, brown as a chestnut, be the character who, according to the Lima gossips, strode naked across the desert? Our approach was hesitant. 'We are looking for a German lady — Dr Reiche'. For the space of a few seconds our greeting aptly mirrored the classic Stanley and Livingstone scene. 'I am Maria

Reiche', she replied softly, clearly ignoring the 'Doctor'.

As we quickly recognised, Maria was properly conscious that she had still to turn her work into a thesis and doctorate. The rabbi, Yonah Ibn Aharon, her associate, was an intellectual, who vaguely welcomed us. He had been stricken with polio when he was five and was paralysed from the waist down. But the disability had given Yonah the drive to study and he said he was fluent in up to thirty languages. Maria met Yonah through Lima's rich cultural underground and found his broad knowledge was soon motivating her thoughts. It was Yonah who introduced her to spiritual concepts of the East, in which she began to see parallels in the ancient Nasca culture.

From her student days in Dresden Maria has drawn on the visions of philosophers — perhaps never more than in these times. One of the Lima columnists, noticing the change, apostrophized the words of the Spaniard, Miguel de Unamuno, saying of Nasca and Maria: 'The footprints in the sand of time sometimes are as small and delicate as a jewel, sometimes as grand as the Pyramids. Often it takes a thousand years or more to understand what the ancient people were trying to express'.

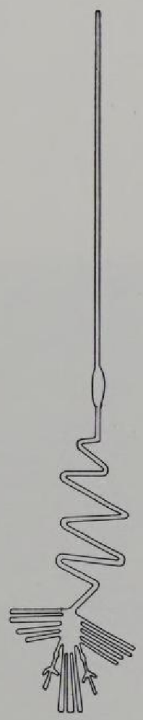
The tiny figure of Maria Reiche beside her canvas topped Chevrolet pick-up truck at Achaco near Nasca.

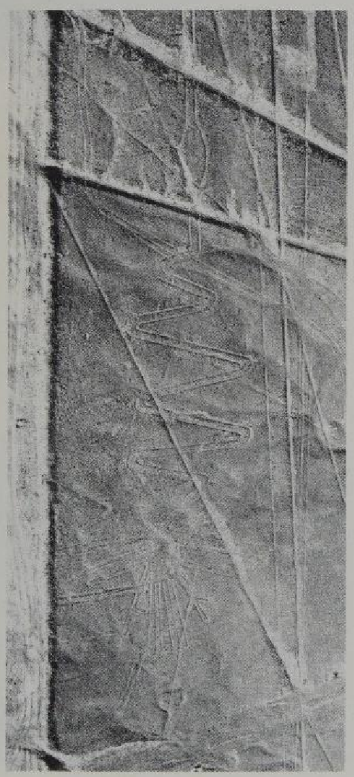
Maria, grateful for Yonah's support, felt she could help the young rabbi master his disability and she purchased the 'Chevvy' largely to carry him to the desert where he could write or meditate. Together they planned a 'Nasca Institute' — a body which Maria believes the lines deserved — but it never got off the ground.

We arranged our cameras and recorders for a scene with Maria leading us to a convenient hilltop from where she could explain the lines. At that time the 'mystery' was in Maria's court with Ibn Aharon pushing her to match stars to lines with dates far back in history. Up to that time Maria had been looking to the Nascas of about fifteen hundred years ago as the most likely line builders. But the young rabbi suggested she should look for star positions up to two thousand years before Christ, or even earlier. As Maria said: 'My friend who has studied the Orient, indicates to me that it really can be that old'. She then took us to some lines beside the drawing of the whale and calculated the year when certain stars would have been rising or setting at either end. These stars and dates she then described for the film.

Maria turned to the microphone and speaking in English was positive as she pointed to one of the long clearings. 'The left hand border of the small triangle', she said, 'was aligned between the points at which Gamma Cassiopeia rose and Alpha Centauri set in about the year 1400 BC'. Maria continued her summary with a masterful command of the theme. Of the stars she mentioned, CAS to astronomers, is a group of five bright stars in the rough form of a W, and remarkable as one of the few recorded supernovae or enormous star explosions in the galaxy. Tycho's nova appeared there in 1572. Alpha Centauri is a bright triple star, and the nearest to the sun.

The changing heavens, or precession, due to the earth's long wobble in





The photograph shows an aerial view of the bird with the serpentine neck, and the line drawing the outline of the figure.

space, explained Maria, could mean a fan-like series of lines drawn over several centuries towards one star. If the later line builders had then cleared the area between the earliest and most recent lines they would have been left with a long triangle. Maria then pointed to the other long side of the triangle we were filming and told us how 'it was aligned to the same two stars over a period of five hundred and fifty years'.

Maria talked about the very long lines — some almost six miles long. 'The people thought the fact that one star rose in the east exactly opposite another star which set in the west had some mysterious significance'. Here was evidence of her 'Quechua' mind. She had learnt how the Indians believe the stars come from 'houses' beneath a flat earth. 'The same star which rose in the east came from a house which contained the star which set in the west', she said.

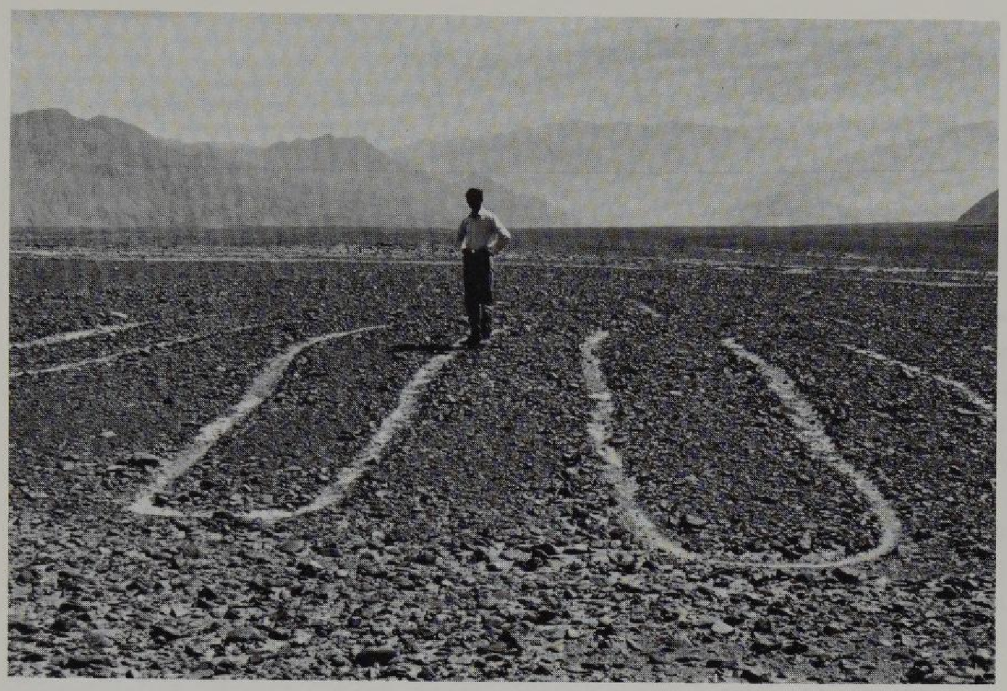
We then asked why the line builders had gone to such extraordinary lengths to plot the movement of stars and mark the sun's solstice. Maria unhesitatingly replied 'For agricultural reasons. The people of the valley needed to know when the rivers, which are dry for much of the year, will fill with water. Before that happens they have to start and clean the irrigation ditches and get their seeds ready'. Maria pointed to the shortcomings of a moon calendar and how by counting twelve 'moons' or months per year the calendar soon gets out of step.

Immediately the camera stopped, Maria turned to Yonah saying 'You would have done better, of course'. He, without changing expression, commented in a dull monotone, 'No — you can do better. You didn't do as badly as I thought you would'. Ibn Aharon had many strong opinions, and while Maria admired his obvious talents she sensed an intrusion. The partnership was short lived. Maria's apartment in Lima, newly acquired in a residential suburb, became Yonah's temporary home. The pampa was a personal challenge and once more she intended to keep it that way.

Our television film — called 'Mystery on the Desert' — was seen in Britain in August 1963 and greeted by an intrigued and clearly mystified press. One television critic, who is unlikely to have known of the local opinions culled by Hans Horkheimer, or the thoughts of the German who had written to Renate after Maria's Zeiss article in 1955, said 'the film makers were lucky to find an old woman with an astronomical explanation, before someone discovered the markings were deposited there by the first flying saucers'.

Jacquetta Hawkes wrote the commentary to the film. Her Peruvian travels, supported by her reputation as an author and archaeologist, commanded attention. In summing up Maria's work she concluded: 'Not all archaeologists would agree with Dr Reiche's theories, or with the very early dates she gives to some of the lines — they incline to think they were made over no very long period'.

But this carefully judged remark reflected Maria's personal concern — unspoken at that time — about some of the expansive ideas introduced by Ibn



Mark Howell by the lizard in the 1963 television production 'Mystery on the Desert'.

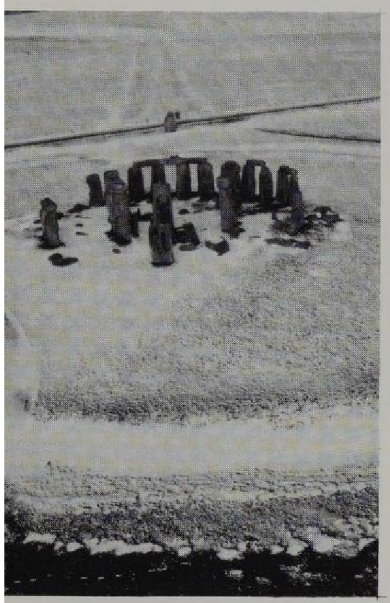
Aharon. After her experiences in Moya she was more in tune with closing moments of the film when Jacquetta Hawkes quoted from Alexander Pope's *Essay on Man* written in 1735:

> Lo, the poor Indian! whose untutored mind
> Sees God in clouds, or hears him in the wind;
> His soul proud science never taught to stray
> Far as the solar walk or milky way.

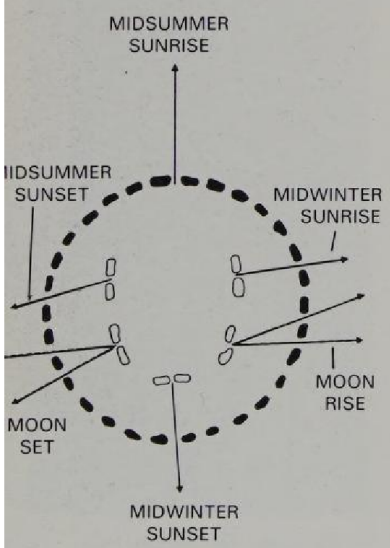
In the months following the film my postbox filled with letters. While some were questioning, others attempted to answer the puzzle. One writer proposed dowsing along the lines. 'Perhaps if you use a freshly cut hazel twig or a piece of quartz on a string as a pendulum you may find these moving as you walk the lines'. It was an interesting idea, particularly bearing in mind some early suggestions about the lines having been pointers to water. Mark, whose special hobby at that time was the science of detecting underground features, returned to Nasca and tried his luck. It was disappointing and neither twig nor pendulum even twitched.

By the mid-1960s Maria was making progress with her analysis of the measuring unit and preparing to publish again. She settled into her Lima apartment, travelling frequently to Nasca. Close friends like Clorinda were nearby and, with interest coming from such magazines as *National Geographic* in Washington, Maria's life brightened. She even found time to travel away from Lima and Nasca to relax.

In 1965 she wrote two articles for Lima magazines. The first concerned the bird design, possibly a humming-bird, on the San José pampa close to the mountains. She called the figure the 'Announcer of Inti Raymi' — the great festival the Incas celebrated at the June solstice. The huge bird with its serpentine neck has a beak more than 450 feet long and, as Maria says, the sun rises on 21 June over a hill to which the bird and its bill clearly point. She next considered the scale of the drawing — it is an impressive work — and she talked of the 'cult of the sun in ancient times'. She was very much in accord



Stonehenge, Wiltshire.



Gerald Hawkins suggested that the stones of Stonehenge may have been aligned with certain positions of the sun and moon.

with Jacquetta Hawkes whose book *Man and the Sun* had been published three years earlier. Jacquetta Hawkes was once described as 'a rare phenomenon', at 'one and the same time a scientist and a mystic', who believed the sun should be adored. In her book she wrote 'a new religion must exalt the Sun of Life more successfully than Christianity has ever succeeded in doing'.

Maria has seldom put such thoughts on paper, though her 'Inti Raymi' account goes further than most. On the matter of the huge bird she said its size indicates not just an important function but a special meaning for the Nascas, and she compared it with Stonehenge, the circle of massive stones on Salisbury Plain in the south of England.

Stonehenge, where the sun rises over the so-called 'heel stone' at the June solstice, was very much in the international news at the time. Each year many thousands of visitors trek to the stones to watch a ceremony conducted by present-day druids — the ancient Celtic priests, for in the minds of many people a sense of power emanates from the circle of stones. A fresh twist to the long story of this extraordinary monument was added by British-born astronomer Gerald S Hawkins, whose outpouring of ideas between 1963 and 1965 set the archaeological world by its ears. Dr Hawkins was working at the Harvard, Massachusetts, observatory and his theories reached Maria in a roundabout way. 'Sensationelle Entdeckung eines amerikanischen Astronomen': the *Hamburg Echo* headlined the 'Discoveries of an American astronomer'.

The prestigious science journal *Nature* had accepted for publication Hawkins's 'decoding' of Stonehenge. 'It's a neolithic computer', he said, implying that ancient men in Britain had understood the complex movements of the heavens. The Stonehenge builders had begun work in about 2200 BC and after several modifications and rebuilding the structure was completed in about 1300 BC.

Gerald Hawkins, like Maria, was treading a difficult path by applying mathematics and astronomy to the established province of archaeology. Hawkins took a plan of the circle with its numerous upright stones and places where stones had once stood; it looked similar to the elaborate face of an old chronometer. From the centre point of the drawing, straight lines, like the hands of a watch, could be drawn to any place on the surrounding circle or extended even further to the countryside beyond.

But the idea that Stonehenge was a neolithic computer came to Dr Hawkins when he used a modern computer to search for the positions of sun and moon close to the horizon. He programmed the machine to make notes like someone four thousand years ago who watched the heavens from the centre of the circle. Gerald Hawkins was trying to decide if the stones were positioned on the straight viewing lines between the centre and any special event in the sky near the horizon, such as a solstice or eclipse.

Maria once said that the Nasca lines 'were a document to the intense cultural activity of the time. . .built evidently with the intention to be

preserved as an astronomical record for future generations'. Gerald Hawkins never went so far with his first accounts. He simply announced that Stonehenge could have been used to predict eclipses of the sun and moon. But at the same time he was being honest with his readers, saying he could not prove beyond doubt that Stonehenge was an astronomical observatory — 'a time machine would be needed to prove that', he added.

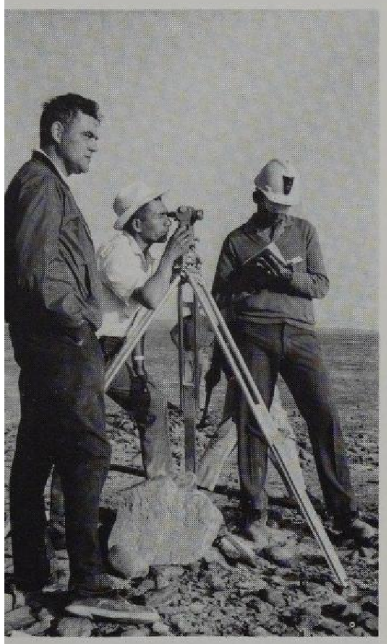
In spite of his qualifying remarks Gerald Hawkins faced waves of academic criticism sweeping across page after page of learned journals. Behind the doors of clubs and universities and between darker comments, the astronomer was gleefully nicknamed 'Stonehenge Hawkins'. Eventually Jacquetta Hawkes was drawn into the fray. Summing up the controversy in an article in the magazine *Antiquity* titled 'God in the Machine', she turned to the world scene of ancient astronomy. Were the people of Britain calculating geniuses in those remote times? she asked, and pointed out that although the Chinese and the Maya had developed observational astronomy 'they were already civilised peoples and had scripts and numerical systems'. Thus, and with many other arguments against Stonehenge being an eclipse predictor, Jacquetta Hawkes concluded that the circle was 'primarily a sanctuary'. Whatever went on there, she said, 'was mainly ritualistic and not intellectual'.

At the time of the Stonehenge saga, the astronomy of Nasca had yet to make any impact on the outside world. Although Kosok's book had been published in 1965 it contained nothing more than those ideas he had earlier passed to Maria. All the precise connections with stars, the measuring unit, the figures and their meanings were Maria's to explain, and with her second article of the mid-1960s she turned to her latest ideas about the measuring unit. She offered the discovery to her Peruvian readers: 'Before it is published in specialist magazines overseas'.

Maria, unlike Gerald Hawkins, was totally involved with measurement units and sequences of hidden calendric numbers. In a comparison of early Peruvian pottery and fine quality modern Chinese porcelain for sale in Lima shops, Maria noticed that a unit she named the 'Peruvian centimetre' — or 'eleven actual millimetres' — could be detected in both. Working on this basis, she published a pamphlet concerning *Measures and Proportion in Peruvian Goldwork*. It dealt with the famous ceremonial knife unearthed from a grave in north Peru. 'The figure seems to have been planned carefully in accordance with standard measures'. Maria suggested a unit of 1.1 centimetres or .43 inch.

Following these presentations she put astronomy aside, feeling possibly that it was an 'open and shut case'. All emphasis went to the unit and she talked privately of working the information into a thesis for a doctorate as the culmination of her efforts. Without much concern for herself she spent weeks alone on the pampa, working some days until her back was weary from brushing the figures and stretching the measuring cords to extract the

Ceremonial tumi *or knife of beaten gold.*



Astronomer Dr Gerald Hawkins with Professor Salas from the University of Arequipa, and an assistant.

fascinating unit. She was forming an idea that the ancient Nascas used a cord stretched at arms' width to make, as she said, 'the standard Peruvian metre'.

In Lima, a corner of her attic apartment became a darkroom. Pictures, maps and scraps of paper covered with notes littered tables and shelves. What she was unable to find space for ended up on the floor. 'I'm meticulous with my research but not very tidy with my cataloguing!' She has laughed about her untidiness many times.

Throughout 1965 her health began to alarm her again; perhaps it was no more than the thought of getting older so, following Clorinda's advice, Maria added bruised alfalfa leaves to her diet. The plant is the lucerne of the pea flower family and, though originally from the Mediterranean region, it has been in Peru a long time. Maria insists it is the 'elixir of youth' and good for arthritis and stomach ailments. She was conscientious and kept to the treatment while maintaining a work schedule which would have deterred many younger people. Between her Nasca commitments Maria kept up an endless correspondence. She wrote to museums around the world for help and was in touch with experts about the temples of Mexico. No stone was to be left unturned in her search for the solution.

Then, in a most extraordinary way, events moved positively for Maria. After the election of President Belaunde in 1963, the Government pushed for development programmes in widely different parts of the country. Ica, to the north of Nasca, with its rich valley was singled out for special treatment and suddenly the face of the old town changed. The plaza was given a modern fountain with coloured lights — much to the disgust of some critics who said it was a waste of money 'when so many people were starving'. But the counter argument was tourism. 'Visitors', the critics were told, 'expect a smart city'. So Ica was given new roads, a splendid museum, a hotel, and Maria was offered funds to produce a new book about the lines. The printing costs in Germany and Maria's fare to Europe would be paid by the Corporation for the Reconstruction and Development of Ica.

Maria saw the chance to present her work in Germany and try for a doctorate from Hamburg. Again, the 'gods of Nasca' were on her side and at last she could show the world what Nasca really meant. It was the opportunity of her lifetime. She set out for Germany in June 1967 after another tiring journey to the pampa. She left behind a growing friendship with Clorinda and a little forest Indian girl they knew as Esparta. The girl had been abandoned by her mother and was being educated by Clorinda and Maria who had great hopes for her future as a singer.

At this time I had returned to South America with my wife, Marion, and we began a series of journeys along the Andes. We passed the San Pablo storehouse many times. On one visit I had to deliver a letter to Maria from a 'lines' enthusiast in Britain, and as Maria was not there I left it with the caretaker. He promised to give it to Maria when 'she returned from

Checking the direction of a line on the San José pampa. The markings across the desert from left to right were made by a road scraping machine.

Germany'. Before leaving London I had proposed another film idea to the BBC. Instead of being a straightforward factual account, this film should be made with a purpose. Perhaps an independent investigation? The idea took time to evolve, though the BBC producers immediately suggested calling in Gerald Hawkins and his infamous computer.

All manner of archaeological surprises and bombshells might be released by a computer investigation and that, after all, 'was what television was all about'. The rationale agreed, the next step was to contact Maria Reiche and Gerald Hawkins. Professor Hawkins was in Boston at the Smithsonian Astrophysical Observatory and Maria somewhere in Germany. Eventually we were given her address by her friends in Lima and the triangle of communcation was complete.

Gerald Hawkins was keen to try the computer technique at Nasca as soon as possible. Supported by science funds from the National Geographic Society in Washington, DC, the stockily built, lively astronomer began work in Peru in December 1967. Over the following twelve months the National Geographic Society financed five survey expeditions and the first ever large scale map of the San José pampa. I joined the July investigation to make a short report for BBC television's archaeological magazine programme,

A Piper Cherokee spotter aircraft on one of the large clearings near Nasca.

'Chronicle'. While I was in Nasca, Maria was in Stuttgart with Renate. Her new book had just been published and she was preparing to address a conference of Americanists — the same elite circle which she had seen in Lima twenty-nine years earlier. Perhaps she hoped that Professor Hawkins's results would vindicate her twenty-seven years of hard work. In her book she wrote: 'In a similar way as the moon directions at Stonehenge, the numerous lines in Nasca. . . could have been constructed as indicators for extreme positions of moonsets and rises'.

But the view was different from the cramped telephone booth in the Nasca Tourist Hotel. Hawkins directed a call to his computer assistant in Boston. The five-thousand mile link was made through an observatory in the Andes and eventually he announced succinctly: 'The first results show no astronomical connection'. Gerald Hawkins, who had obviously anticipated something of the kind, was unmoved, but I knew Maria's conviction at first hand. She would be astounded. What had happened to the Kosok calendar?

Dr Hawkins, whom most bookmakers would have given as odds on favourite to come up with an 'astronomical' conclusion, if not a fully fledged Stonehenge-style calendar, was saying 'it's no go'. Maria, who was with Renate in Stuttgart, could have had no inkling of what was happening in Nasca, yet when she addressed the Americanists ten days later she omitted every reference to astronomy and measurement units. Her account kept strictly to a description of the site and the figures.

In his 'Final Scientific Report' for the National Geographic Society Expedition, Gerald Hawkins confirmed the preliminary result. He put on paper his method, results and analysis which revealed that while a small proportion of lines may have pointed to some heavenly body seen by Nascas, the vast majority went in random directions. Why? Perhaps with the Stonehenge saga still too close for comfort, the astronomer was being cautious.

Gerald Hawkins discussed several possible explanations beyond his expertise: astronomy. The lines could be pointers to the horizon, though he gave that idea low priority; or the whole site could be a 'spirit place', and he referred to Alden Mason who mentioned these early beliefs. But, as Gerald Hawkins said, these ideas 'are nothing more than speculations'. When the BBC programme was shown all references to Maria were excluded, and she was indignant when friends in England told her of this. Presenter Magnus Magnusson summed up by saying: 'It looks as if this is one enigma from the past that modern man, with all his technological ingenuity, may never solve'.

Author Tony Morrison with Maria Reiche on the San José pampa in 1969.

Maria's two year break in Germany was time well spent. She kept in touch with Clorinda and arranged for Esparta to travel to Germany where it was Maria's wish that she should learn music. In 1968 she published her new book, also titled *Mystery on the Desert,* which was given a foreword by Professor Trimborn from Bonn thanking her for her 'tireless work'. She renewed her contact with the German press and *Frankfurter Allgemeine* described the book as

an 'editorial sensation'. The illustrated magazine *Quick* presented the first large colour photographs — taken by Maria with her Contax. *Hobby,* another illustrated journal, gave six pages to her story. Eye-catching headlines said: 'For the Eyes of the Gods — new information about the ground drawings in Peru'.

Towards the end of her stay, Maria briefly visited England to see stone circles and talk with Professor Alexander Thom, the acknowledged expert on ancient measurement units. In May 1969 she lectured to a small audience at the University of London. Then, her travelling over, she returned to Peru.

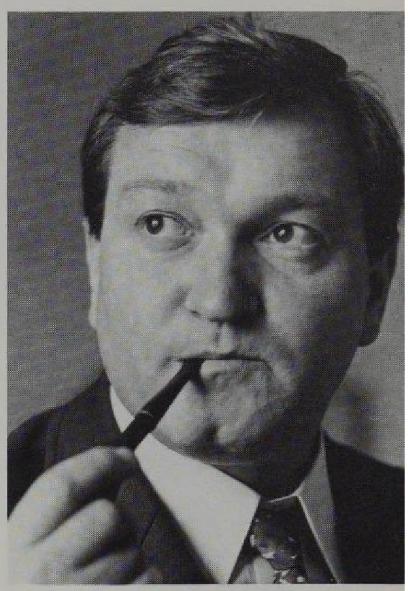
In Lima she stayed with Clorinda before moving back to the San Pablo storehouse. 'There is nothing to keep me in Lima', she said. The city had grown beyond recognition to a vast sprawl of two million, mostly poor Indians from the mountains.

But Nasca, too, was changing and following the publicity the first groups of tourists arrived. The results of Hawkins's investigation were still being passed around the hands of academics, and the only public airing on television had been short. Maria simply brushed off the findings as 'unscientific — Hawkins didn't look far enough'. Undaunted, she started to tramp the pampa again. On one occasion when Marion and I called at San Pablo we found Maria on the desert nearby. Clorinda's husband had just been killed in a car accident and the lady of the lines was unusually quiet. It was lunchtime and the only food we had was a large sweet melon from the valley. We offered her a slice but even that was too much as she had returned to the scantest of diets. After a couple of bites she shook slightly and said 'I'm sorry, I feel ill. It is too much'.

But Maria was about to face a problem which overshadowed all thoughts of the computer. The imaginations of millions of people worldwide were caught by the idea that the Nasca lines had been built as runways for ancient astronauts.

Erich von Däniken, a Swiss hotelier turned writer, launched his best-selling speculation on the world in 1968. Within months the book was excerpted in a dozen countries. 'What is wrong with the idea', von Däniken asked, 'that the lines were laid out to say to the gods: Land here?' While archaeologists shuddered at what they felt was professional heresy, the paperback editions of *Chariots of the Gods* poured from the presses. Alden Mason may have been my guide at the beginning of the 1960s, but by 1970 travellers young and old with a von Däniken in their hands were streaming across the desert looking for a spacecraft.

Ruin faced the pampa overnight. Cars, motorbikes, trekkers with donkeys, even artists who made their own figures to be seen by the gods — all were scuffing the fragile desert. Maria's grouse that a pilot in Hawkins's team had landed on one of the 'runways' paled into insignificance. 'The pampa will be destroyed', she declared to everyone who cared to listen and, aged sixty-seven, she took up the fight where she left it fifteen years earlier.



Erich von Däniken.

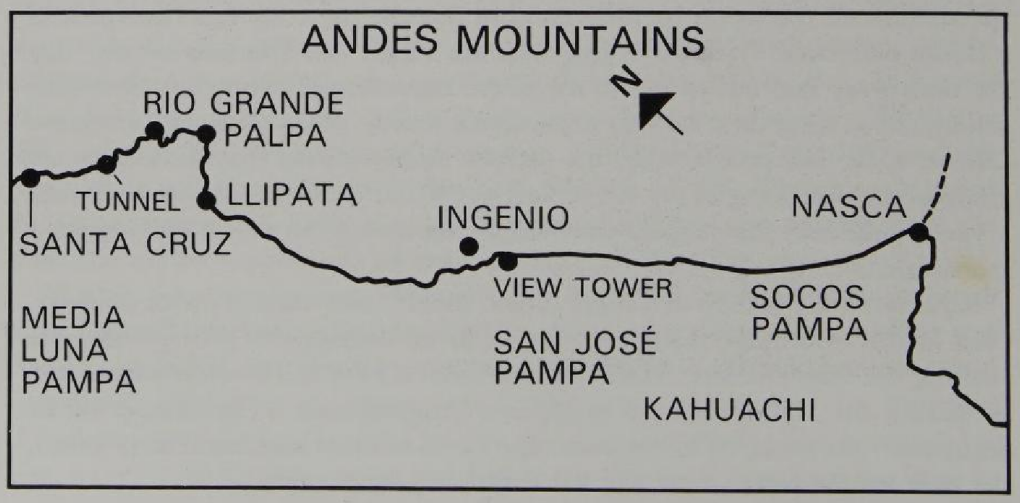
CHAPTER 6

The Lines of Nasca -a pictorial survey

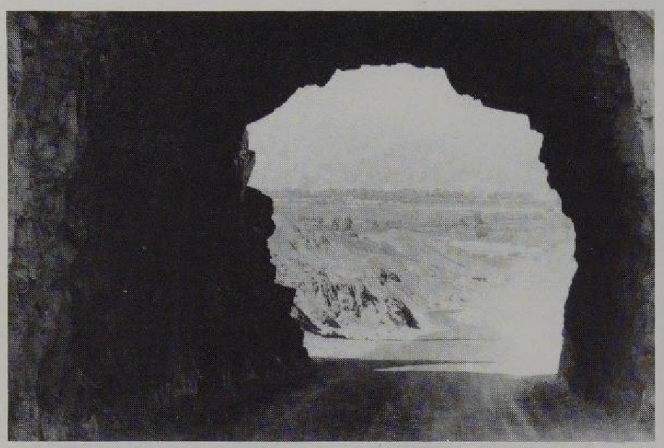
Familiarity has given the name Nasca to the markings covering almost five hundred square miles of desert. While many of the finest drawings are near Ingenio to the north west of Nasca, a practised eye soon picks out straight lines and clearings in a much larger area. Duncan Masson, who became an accomplished desert traveller, found numerous outlines in the sand among a wilderness of dunes on what he called the 'old road to the sea'. In recent years, with the upsurge of interest in the lines, pilots of light aircraft have constantly reported fresh discoveries.

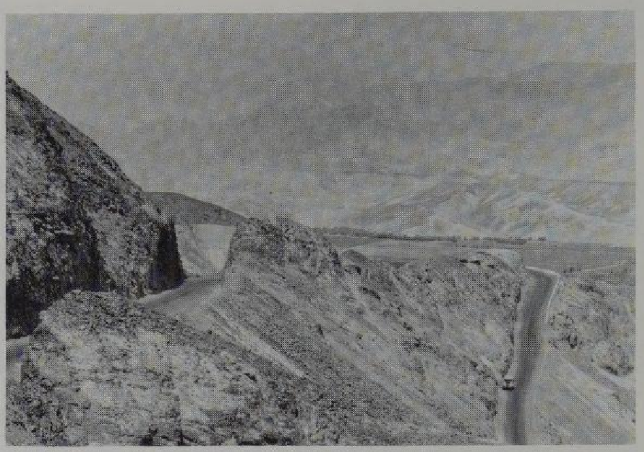
In the most general terms the markings are best seen from the air. This is particularly true for the animal and plant drawings. Alternatively, any high point along the highway from Santa Cruz to Nasca offers views of lines.

Most of the markings fit into three simple categories. The straight lines which unswervingly cross the desert passing straight as an arrow over gullies and hills — usually linked to the large clearings. Then there are the drawings of animals, plants and spirals — found mostly on relatively level places. Third are the figures modestly constructed by heaping stones or clearing rocks from a hillside.



The line builders of Media Luna (Half Moon) pampa gathered stones into small heaps which lead across a rippled sandy desert. Wind blowing from the coast has kept the outline clear as far as the craggy horizon.



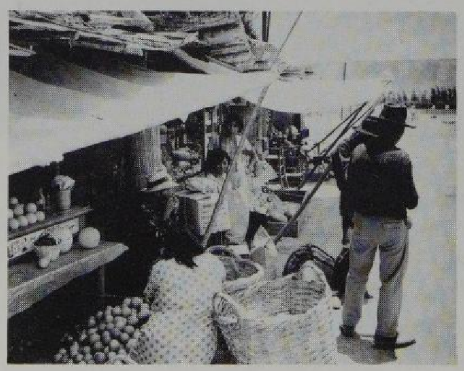


Between the towns of Santa Cruz and Rio Grande the highway passes through a short tunnel (left) beneath the crest of the 2,500 feet high Muna mountain. Right, the Rio Grande valley and the distinctive flat-topped desert pampas.

A grid of parallel lines scraped on a stony spur between Rio Grande and Palpa. Lower down at the valley edge a large clearing is now used by villagers as a football pitch.

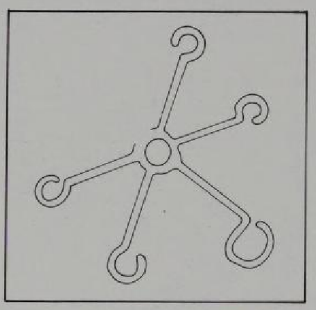
Many trapezoidal clearings were built on hilltops above Palpa and Rio Grande. Here the pointed ends usually lead upstream towards the mountains, while the wider ends tend to face the open desert or western horizon. Grids of lines run alongside these clearings which may be connected by other lines. Some of the clearings are more than two hundred yards long, and a first impression suggests the size is limited only by the available space.

Long clearings are prominent features on the cuestas *or ridges above the settlements of Palpa and Rio Grande. Grids of parallel lines run near the clearings often taking a different direction. Car tracks and other scars confuse the patterns.*

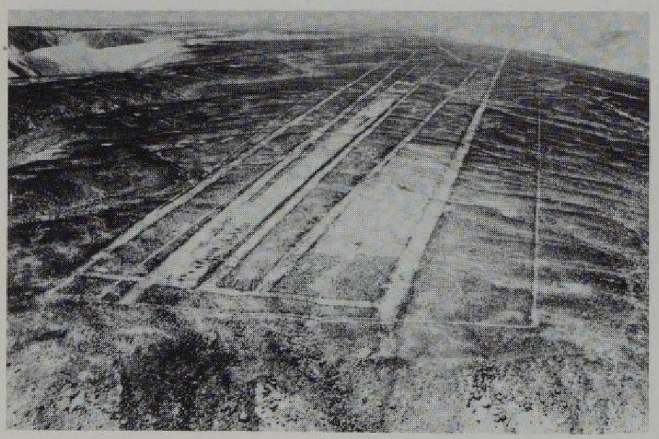


Palpa.

A curve of the Pan American Highway enters at the bottom of the picture and cuts through a long dry mud flow near Palpa. Straight lines lead from the bottom of the hill to the crest. A modern political sign is scratched on the slopes to the right.



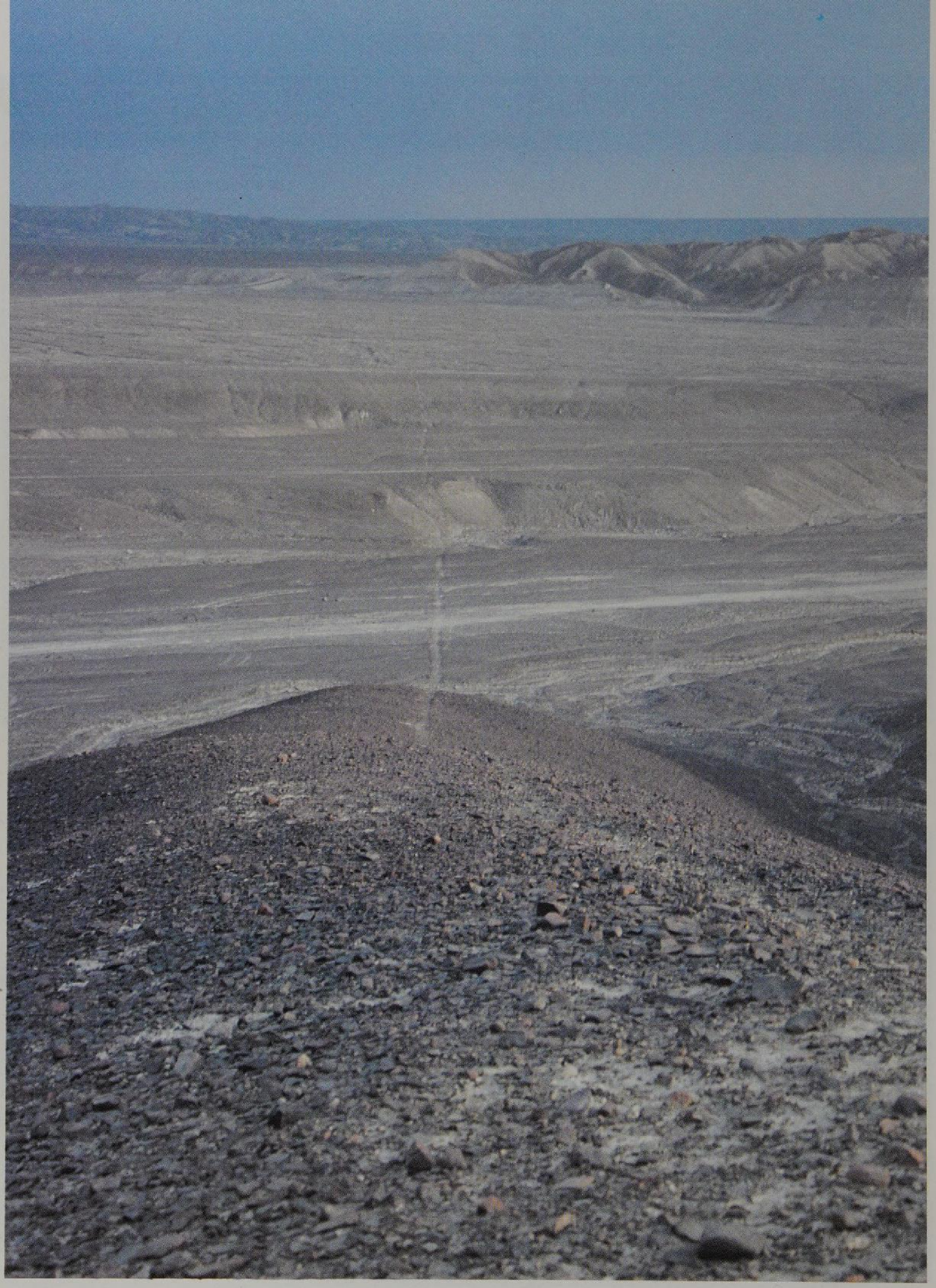
One of the most unusual designs — a five armed paddle wheel was made in the wilderness near Palpa. Heaps of stones remain in the clearing as they were left by the line builders.



The stony desert near Llipata is crossed by many straight lines. Paul Kosok made his first observations in this wilderness in 1941, discovering grids of lines (left) and the design resembling the tail of a bird (right).

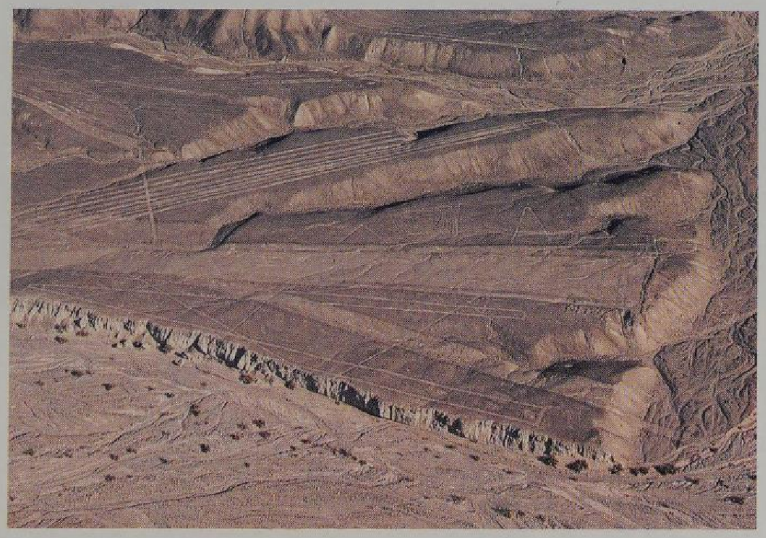
Heading south west to Nasca, the Pan American Highway climbs from the Ingenio river valley. The broad San José pampa, a flat desert, lies either side of the road. Sometimes the name Jumana *is given to the pampa on the right which slopes gently towards the Nasca river.*

Maria Reiche used a room in this roadside store for more than twenty years. A path through the trees leads up to the San José pampa.



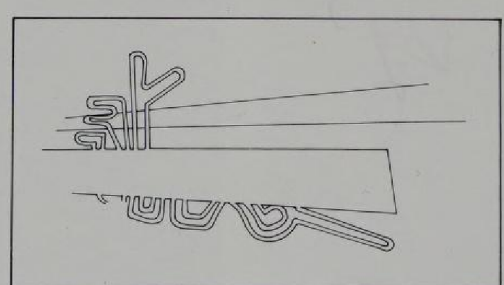
The desert near Llipata is exceptionally stony, yet a line leads across the wilderness from a hill to the edge of a distant valley.

The San José pampa near foothills of the Andes mountains.



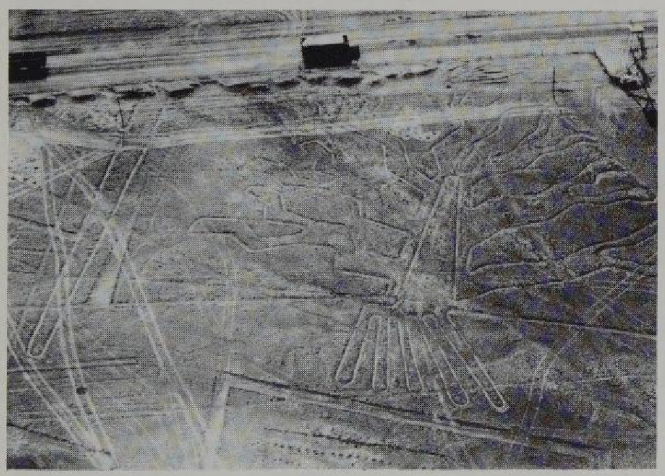
Above, grids of lines and clearings cover these natural finger-like projections in the Palpa valley.

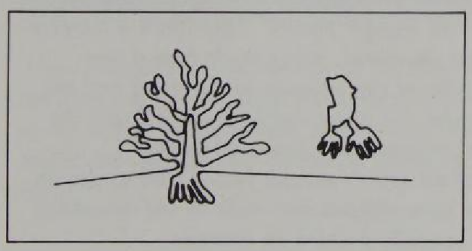
Above right, infra red colour film sometimes reveals the most indistinct features.



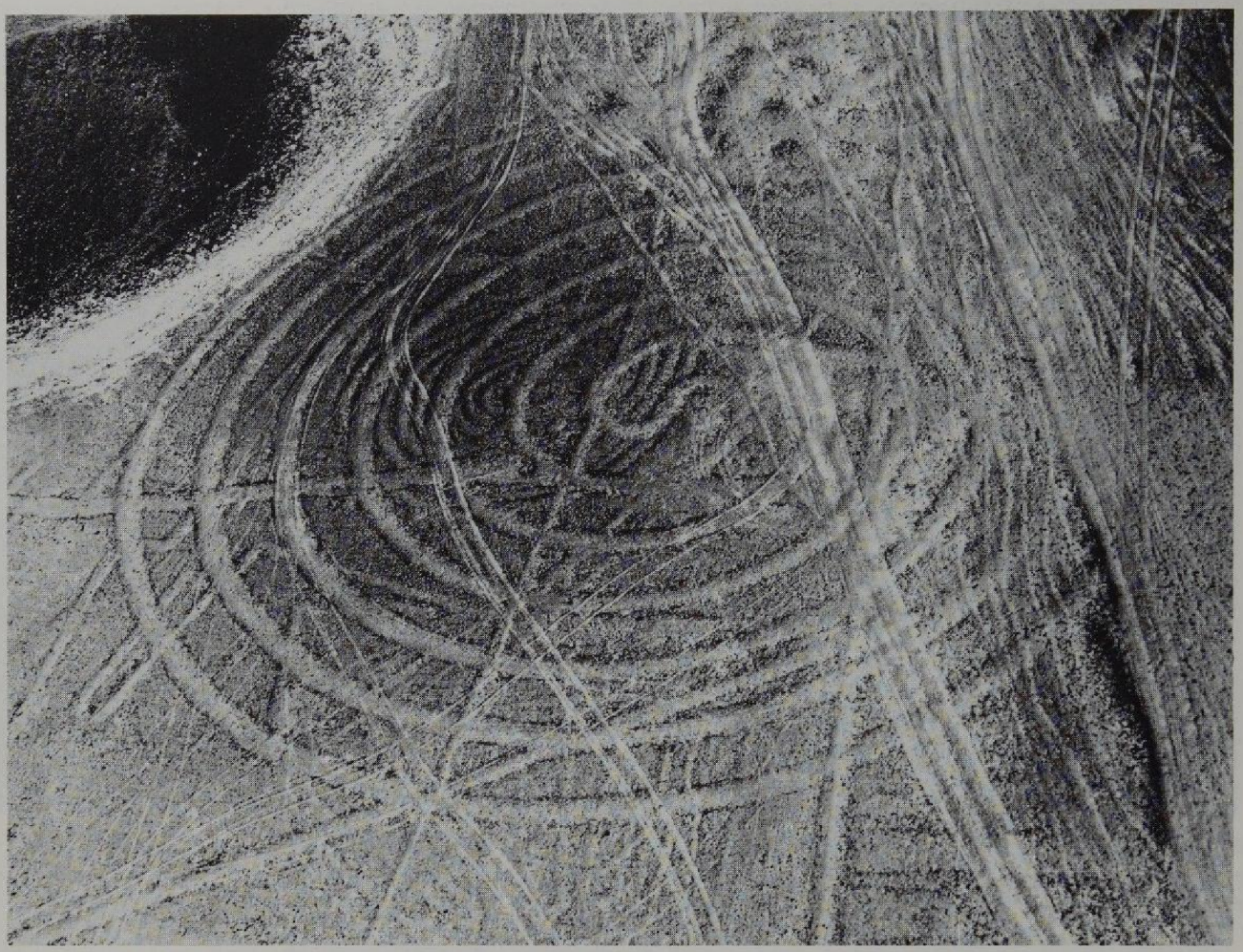
Even by 1963 when this photograph was taken, the San José pampa had been seriously damaged. The black-topped Pan American Highway climbs from the Ingenio valley to the desert, where unmade roads branch to distant farms. Spirals, clearings and two large designs have been virtually destroyed. This area is now the heart of the 'Archaeological Zone'.

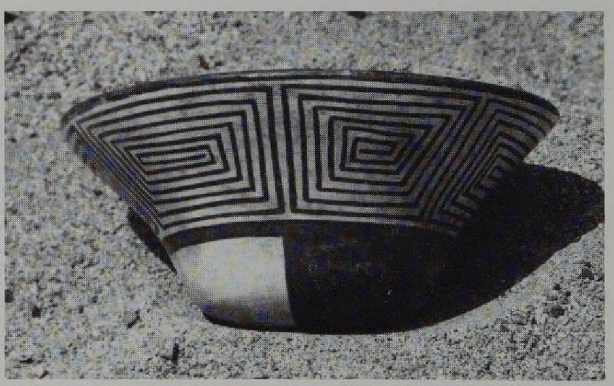
Since the mid-1970s, the San José pampa has been guarded. Peruvian laws to protect archaeological sites can involve heavy fines for trespassing, and visitors are offered the free use of the roadside viewing tower.



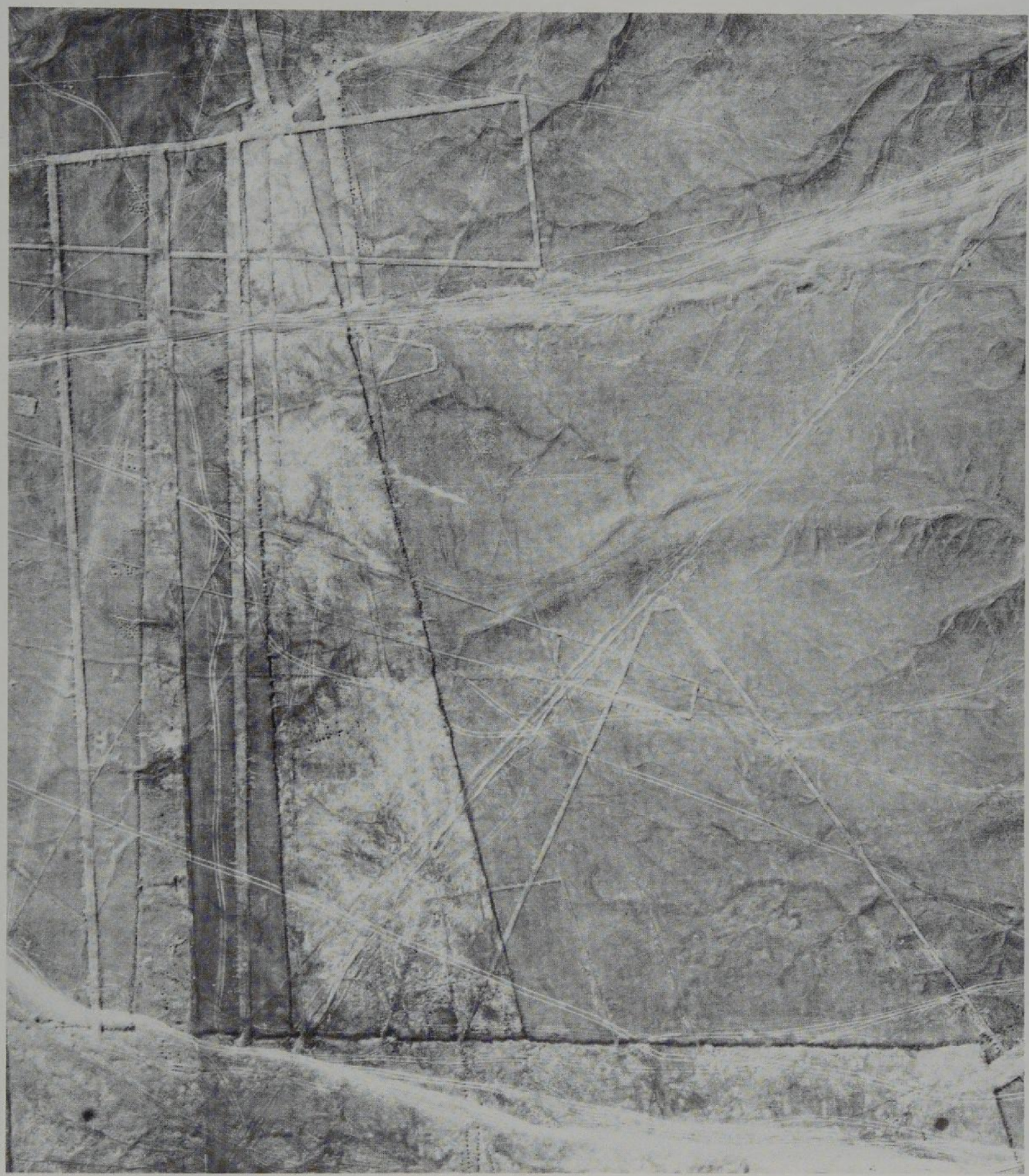


This seaweed or tree figure (above left), and these curious hands (above right) are close to the viewing tower. The four fingers on one arm and five on the other have provoked speculation about some connection between the hands and the monkey figure on the same pampa. The monkey, like the hands, has only nine fingers.

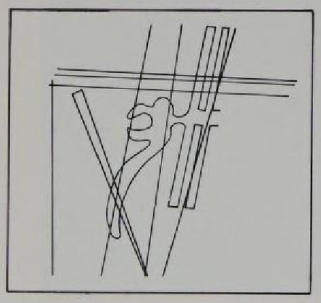




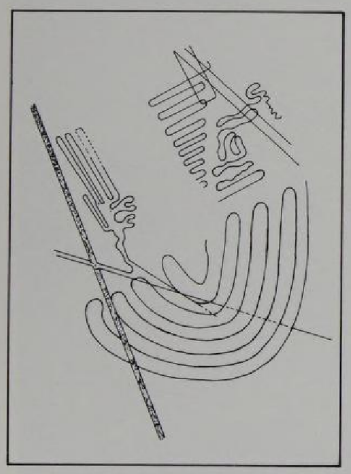
Apart from straight lines and zigzags, spirals are the most numerous design on the desert. Sometimes they are isolated like these on the San José pampa, occasionally they are incorporated within another pattern. More than a hundred spirals have been discovered, many made from a line which can be followed continuously to the centre and out again. As a symbol the spiral can be found all over the world and its significance has prompted endless speculation. Not all spirals around Nasca were drawn in the desert: some were chipped into rocks in the mountains and some were carefully painted on ceramics.



These clearings are on the edge of the Ingenio valley, approximately two and a half miles from the view tower. The large trapezoid is crossed by a low wall of stones scraped from the clearing at the bottom of the picture. Other lines and clearings open directly from this clearing, and the darker dots at each end are simple heaps of stones. Some closely spaced double lines are car tracks.



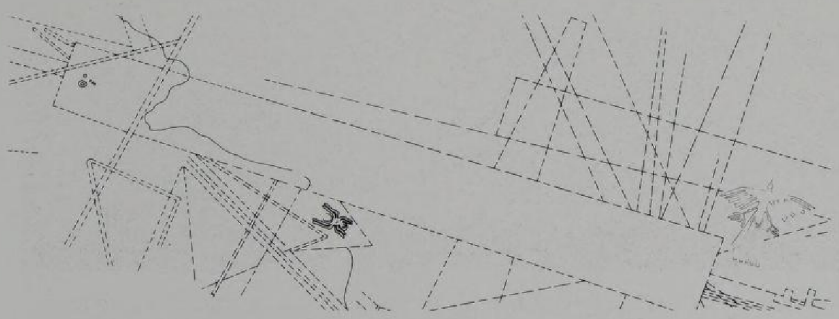
On the San José pampa, near the foot of the mountains, this bird design is surrounded by lines. Some lines cross the figure obliterating parts of its outline, while others are clearly laid beneath the drawing. Two 'eyes' are just discernible. The lighter, wavy patterns were left by ancient streams.



This long clearing is close to the mountains on the San José pampa. Low stone heaps, each with a diameter of about 3 feet, stand at the distant end of the clearing and at its junction with a branch, laid to the right (north). A fan-like design (or wings) is close but apparently not connected to a small figure of a bird nearby. These figures have been partly obliterated by water flowing through the broad courses.

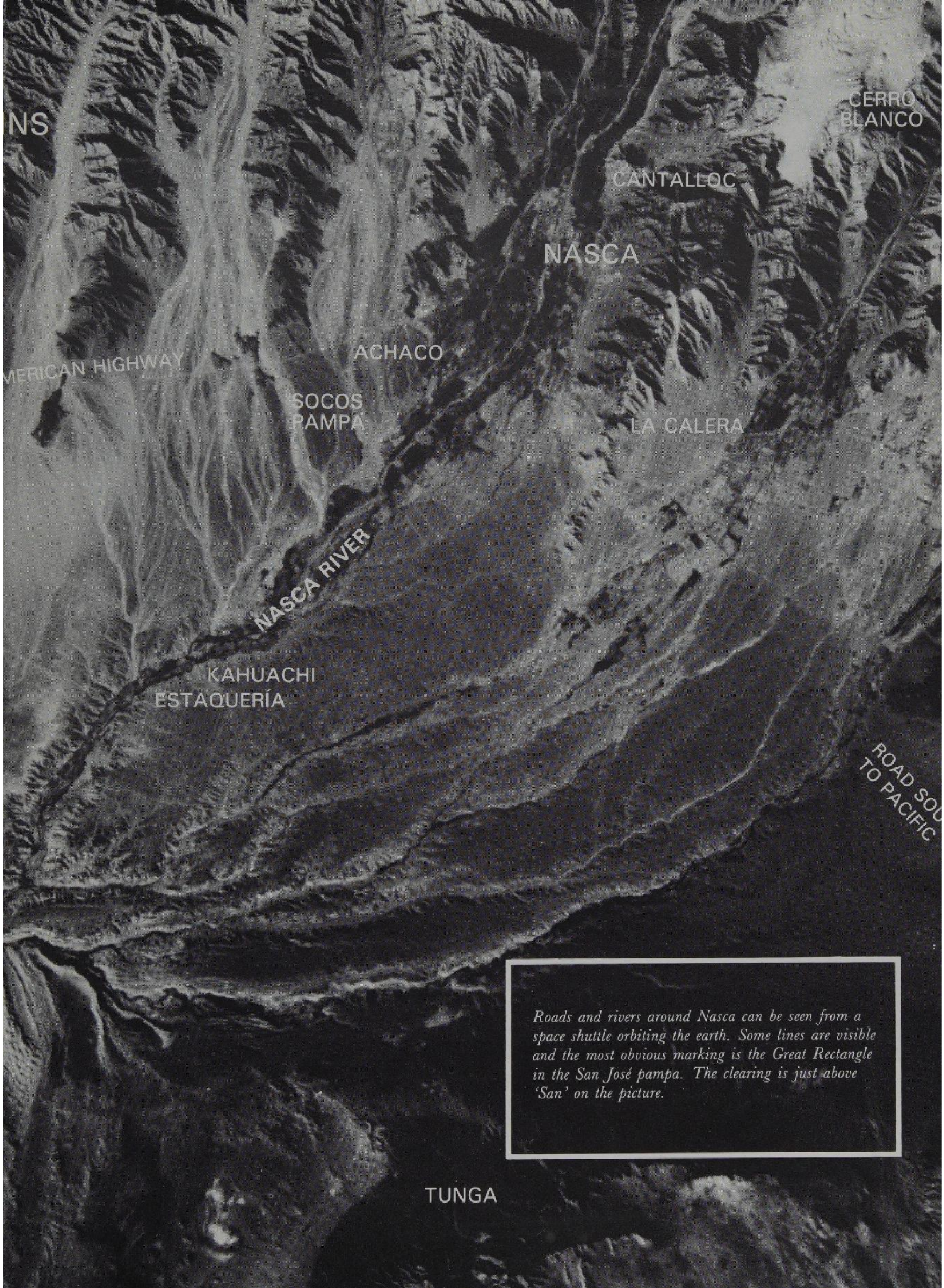
A rectangular clearing over half a mile long was built on the San José pampa. As a feature, this Great Rectangle appears to have been constructed over many of the lines crossing its width. A major extension of the clearing leads towards the distant mountains.

The outline of a spider is close to the north-western facing side of the Great Rectangle (the left side in the picture opposite). Its size can be judged from the numerous car tracks on the surrounding desert. The heavy dark line on the right is the clearing's raised stone border. A line through the spider points in the direction of Orion. Others to the left of the figure could have been directed to the same constellation in other centuries.



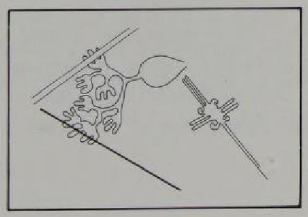
Surveying the Great Rectangle in 1968. A sightline through the stone heaps at each end aligns with the position of the Pleiades in AD 610.

ANDES MOU
RIO GRANDE
PALPA
NEL
CERRO FRAIL
VIEW-TOWER
SAN JOSÉ
CHURCH
SAN JOSÉ
PAMPA
LLIPATA
RIO GRANDE
INGENIO VALLEY
DIA
NA
MPA
JUMANA PAMPA
NASCA RIVER
RIO GRANDE
5
10
MILES

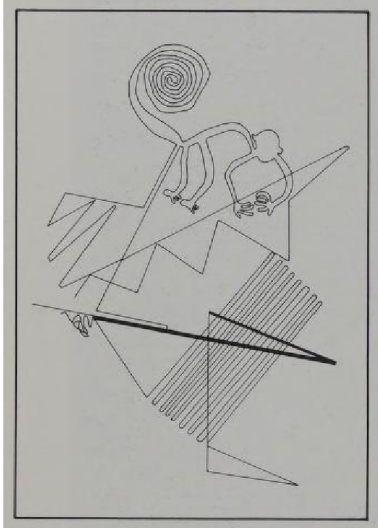


Roads and rivers around Nasca can be seen from a space shuttle orbiting the earth. Some lines are visible and the most obvious marking is the Great Rectangle in the San José pampa. The clearing is just above 'San' on the picture.

More than 450 feet from beak to tail, this fine bird design is close to one end of the Great Rectangle (nearest to the camera on p106). Lines cross the bird and one leads towards the sun's solstice point on the horizon. Stone heaps appear as black dots on some lines, and a larger heap stands at the end of the clearing. One of the bird's tail feathers incorporates a line making contact with the clearing.

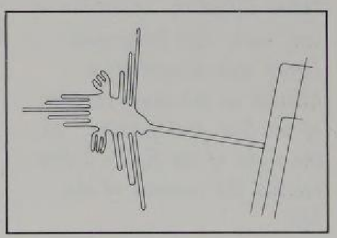


A grid of parallel lines connecting with the Great Rectangle lies between the tail of the bird and two small designs. Both of these patterns resemble plants and have branches and petals. Small heaps of stones were gathered in clearings and some form lines similar to those on Media Luna pampa.



This drawing of a monkey was discovered in 1952 by Maria Reiche. Being more than a mile from the highway on the San José pampa, the figure is relatively undisturbed and its connection with the grid of lines is distinct. Soon after discovering the monkey, Maria Reiche suggested how the line crossing the grid of lines pointed to the rising of the star Benetnasch of the Great Bear, or Plough, in AD 1000.

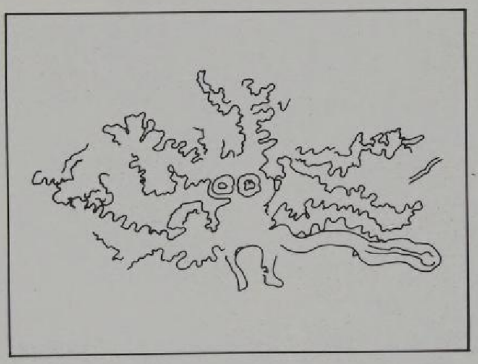
A humming-bird design on the San José pampa near the Ingenio valley appears to be connected to a grid of lines. The actual point of contact has been obscured by scuff marks. Car tracks have damaged the lines on the right but avoid a small, very faint design just below the bird's bill — possibly a model for the actual figure.

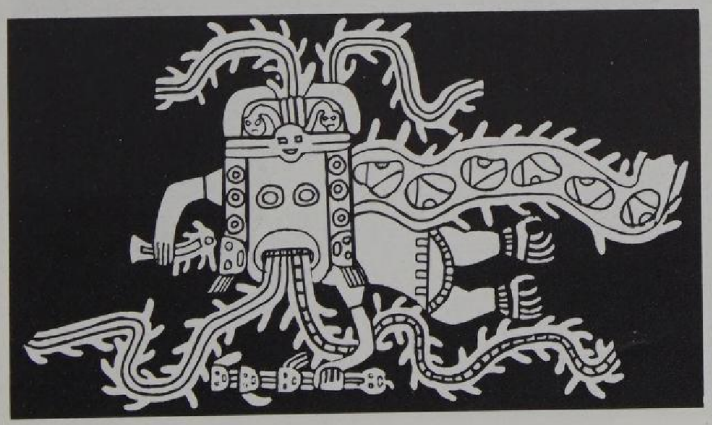


Animal figures, possibly llamas, on the San José pampa. In ancient times the breed was smaller than it is today. The corral or pen is on the right.

Often called the spaceman or owl man, this large-eyed figure was drawn on a hillside at the southern edge of the San José pampa. To the right of the figure a line reaches the summit of the hill.

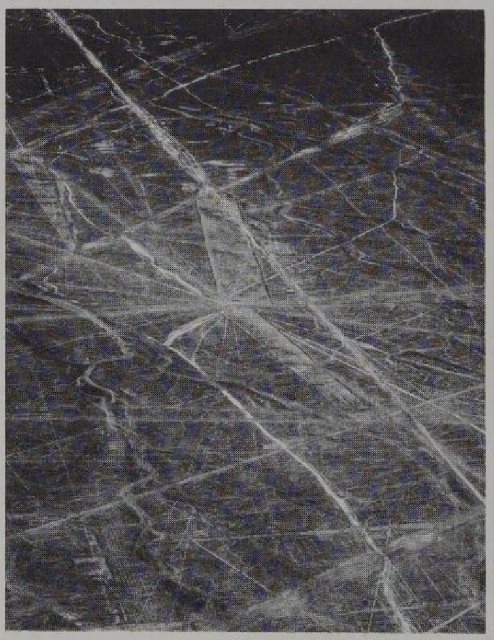
Discovered in 1983, this scarcely visible figure was built from stones. Like the llama figures on the opposite page, this design was constructed by heaping stones above the general level of the desert surface. The construction is simple and here seems to represent a mythical being often portrayed with elaborate appendages on some of the region's earliest pottery and textiles (see below). Some authorities believe this particular deity was connected with water, and certainly the figure stands on a gentle slope above old water courses.



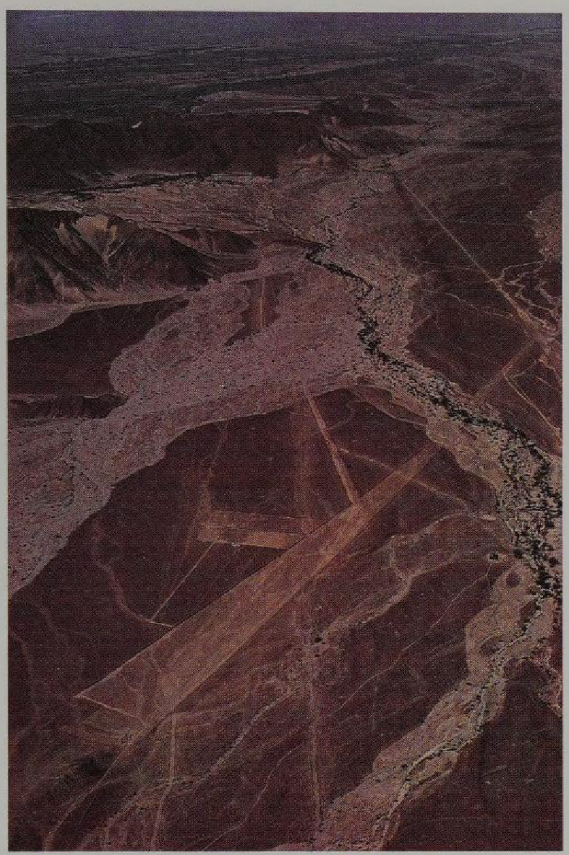


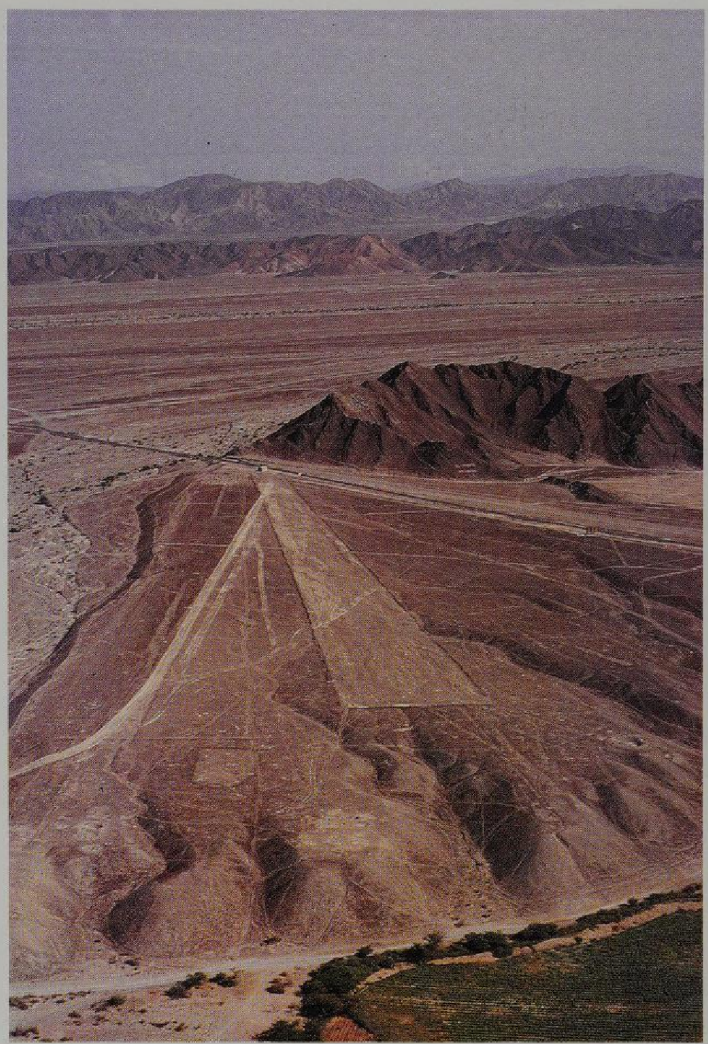
The outline of the figure in the photograph at the top of the page can be compared with a design from a textile of the Paracas culture dated 600 BC. The large-eyed being holds trophy heads.

Maria Reiche called these areas 'starlike centres' and discovered they are a common feature among the lines. At some centres as many as thirty lines begin and certain of them connect with others up to eight miles away. Thus the varied features of the landscape were intimately connected by the line builders.



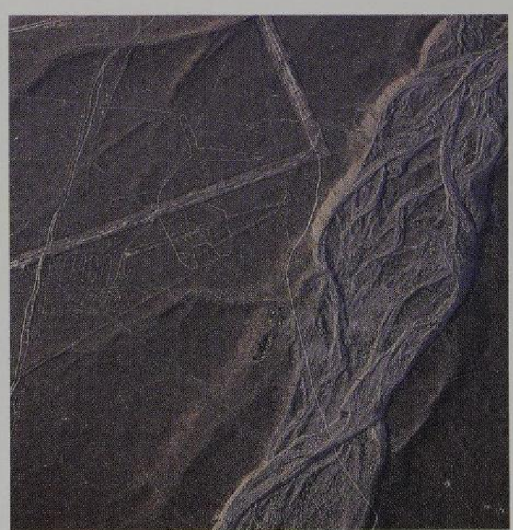
The majority of centres consist of a natural hill, or sometimes a low stone cairn. Often the connecting lines are partly obliterated where they cross water courses washed by infrequent storm water. The small black dots are piles of stones, and the broad diagonal line in the picture on the left is the dirt road to Jumana.





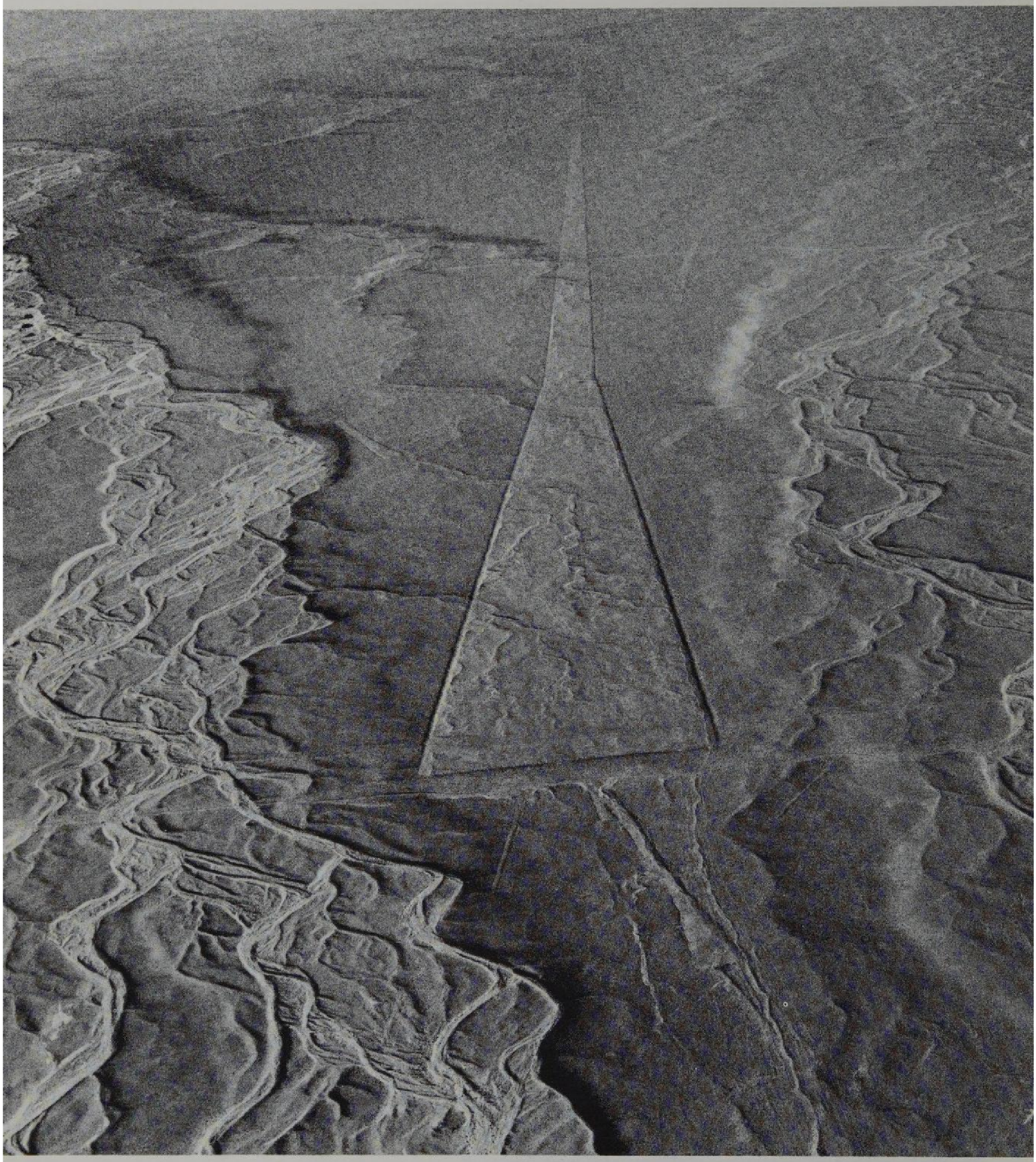
Above, clearings connected by long lines with distant 'starlike centres'. Clearings and lines were built alongside many of the trapezoids.

Right, a large triangle near Achaco at the edge of the Nasca valley.

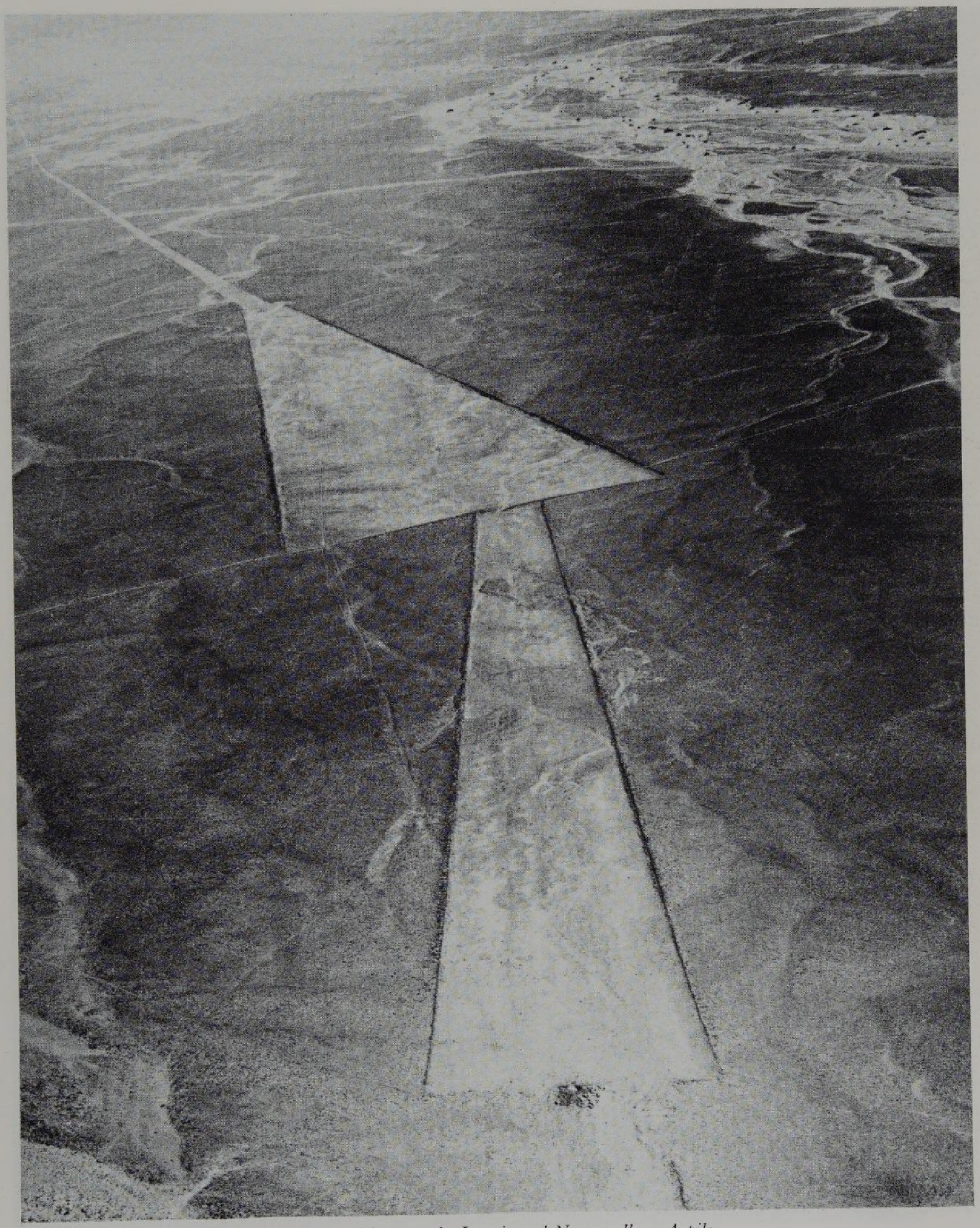


The whale figure in flat, open desert near Achaco.

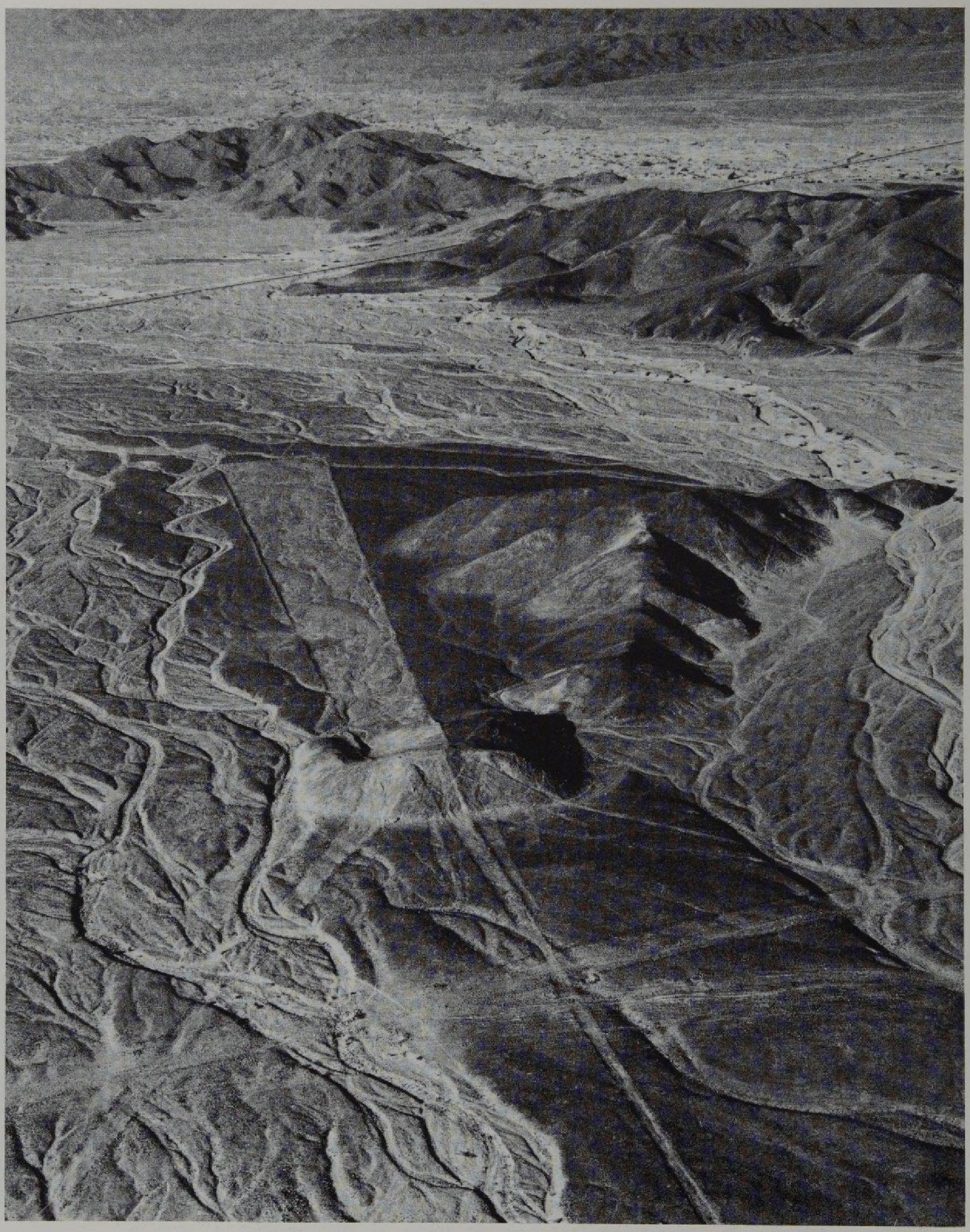
Maria Reiche explaining the astronomy of lines at Achaco to Allan Reditt in the 1963 television production 'Mystery on the Desert'.



While the majority of the markings are close to the valleys which have been farmed for centuries some, like this clearing, are in the heart of a wilderness. Here in Socos pampa, the desert is patterned by dry river courses. As the undamaged path crossing the bed on the left suggests, water has not flowed here for a long time.



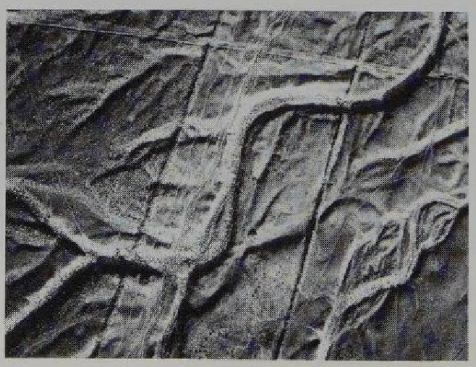
These clearings were built on flat open ground between the Ingenio and Nasca valleys. A pile of stones was made at one end, and from the other a long line leads to the distant horizon.



On Socos pampa a broad clearing leads to a hilltop where it connects with lines. One line extending to the bottom left hand corner of the picture has been partly washed away, though its outline remains visible in the ancient water course.

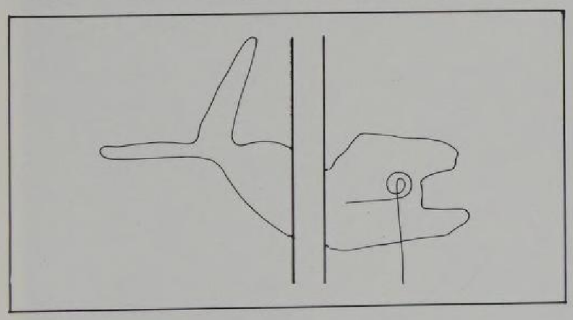
A triangular clearing is met by a line at a bend of the dry stream bed. Water may not have flowed here since the lines were built. People and animals pass by on the way across the desert — the narrow irregular lines are simple tracks.

Some lines cross many miles of open desert. This line from Socos pampa leads from a grid of lines to the Nasca river valley hidden by the distant haze.



A broad line across a water course which must have been dry since the stones were scraped aside. The low parallel walls are unbroken.

Close to the edge of the Nasca valley at Achaco the line builders drew a whale. Lines, clearings and the whale are close to water suggesting, perhaps, a connection between the animal 'spirit' and the early farmers' reliance on the arrival of water in the river bed.



Lines and clearings were arranged around a low hill at Achaco. Although nearby — in the top left hand corner of the picture — the whale design cannot be seen distinctly from the summit.

Over one thousand heaps of stones are set in a long triangular clearing at the edge of the Socos pampa. Other clearings nearby are virtually empty. Stone heaps like these may have been ritual offerings to ancient gods or simply left there by the line builders. Without clear evidence there can be no certain answer.

A full moon sits close to the mountain horizon behind Socos pampa — directly below it, a line leads to a low hill. The apparently obvious connections have never been proven.

A spiral at Cantalloc, one of Nasca's most mysterious places, is just another part of this unsolved puzzle. Some experts believe these designs came from man's conscious efforts to reach infinity.

CHAPTER 7

In the Spotlight

The idea that the Nasca lines had been an ancient spaceport came at the right moment. American astronauts and Soviet cosmonauts were whirling around the earth leaving millions of people on the edge of their seats looking for the next adventure. If man could reach the moon then planet Earth could be visited by strangers from space, or so visitors to Nasca argued.

'Why not? Just tell me why not? Is there any good reason why these runways were not built for space travellers?' Maria listened to such direct questions implacably. She enjoyed the fresh company: 'Many of them were young, mostly with beards — making them feel masculine, I suppose'. She made many friends — Australians, French, Dutch, Japanese; an endless stream. Often they helped with her measuring and, as she remembers, 'they came with their girlfriends, often with children, and with very little money. All they wanted was to be on the pampa and meet its gods'.

After all her efforts to draw world attention to the markings Maria found herself caught between mathematics and mysticism. She had heard of flying saucers from the local people and she kept abreast of reports of the scores of unidentified flying objects from the rest of the world. South American newspapers thrived on tales of extraterrestrials: 'There is one place on the pampa which is very strange'. Maria always tells that story well: 'I found it when I was measuring the. . . No, perhaps I'd better not say where it is, but anyway that doesn't matter too much — it's a place where the compass doesn't work. The needle stops at any point on the dial and you lose yourself very easily'. Maria has no explanation for this bizarre condition except that 'someone once said it could be caused by a large piece of buried metal'.

Her repertoire is filled with stories of curious happenings. In the same breath as intricate geometry she talks of ghosts and moving lights on the desert. These accounts may seem unbelievable from the standpoint of the modern world but they have remained deeply seated in the Indian mind. Thus, in many ways Maria's sympathies in the early 1970s lay with von Däniken and

his disciples as they reached out for strange culture heroes. But then, as crowds scrambled over the pampa, her sympathy was put under great pressure and she became incensed by the uncontrolled, thoughtless destruction.

'It is only within the past few years, since the lines were popularised as providing the basis for theories about landings by people from outer space, that the real threat has developed', Maria wrote to the Lima press. For sightseers the world over the joy of Nasca was to be photographed beside a line, or better still by one of the spaceman-like figures.

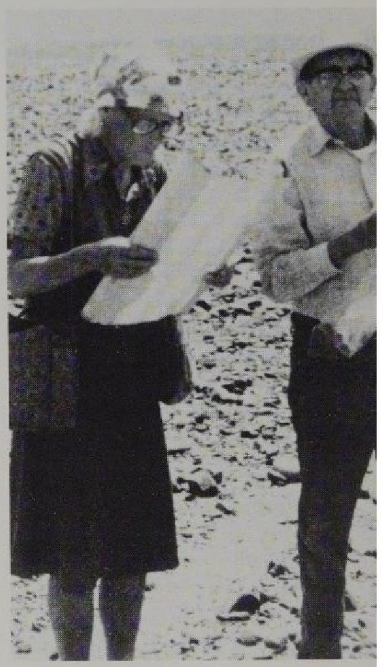
In the same years Maria began to complain about the increasing local pollution. Worst of all the pollutants, according to her, is the fallout of dust from the extensive Marcona mine in the desert some twenty-five miles south of Nasca. Open-pit mining, which began at Marcona with American finance in the 1950s, depends on daily quarrying with explosives. Maria believed that its fine dust carried skywards by the blasts settled on the pampa and discoloured the stones. 'The pollution spoilt everything', she told visitors. 'Even the polish has gone from the stones — you can see it in my earlier pictures. Now you can't'.

This age-old burnish or 'varnish' is characteristic of certain desert rocks, but they were not the only things affected; Maria pointed to other changes. 'The dust altered the climate. It brought rain — once for two days, then more, and pools of water lay on the desert for the first time since the lines were made; and it's often cloudy. Before it was not like that, the sky was always blue'. She has had over forty-five years to study such changes and disagrees strongly with Gerald Hawkins who, because of the haze, could not see certain stars near the horizon. According to Dr Hawkins, any accurate astronomy at Nasca would have demanded clear skies. He contended: 'I found better conditions in Malaga, Spain'. But Maria has never reversed her opinion and maintains quite firmly that lines were directed to the horizon where the sun, stars and moon appeared and disappeared. Or, as she said, 'the lines could have been pointed to significant horizon marks such as hilltops, rocks or passes'. Points like these are often lost in the present-day haze.

Duncan Masson, whose formidable knowledge of the area dated, as he once put it, from 'Before MR', agreed with her about the haze. 'This place always had sun', and he told me a year or two before he died, in 1984: 'Now we get more cloud and I don't think it's just the mine. The climate is changing, too'.

In the early 1970s pollution was a growing international concern and Maria was understandably worried. Up to that time Nasca had been a quiet, idyllic backwater. Far from the mainstream, with its rich valley hanging in a mirage above the wilderness, it was Maria's Shangri La. But across the Pacific, French atom bomb tests on Mururoa atoll almost four thousand miles away were sending radioactive clouds towards the Andes. Peruvians believed they would be caught by the high-trailing dust.

Then, for everyone to see, right beside the desert highway, the world's pharmaceutical giants were advertising insecticides already under scrutiny or



Maria Reiche and Duncan Masson agreed about the worsening haze. But on other points they were not always in accord.

Known by its local name, the niño, *a warm current affects the rich coastal sea and the desert climate.* Niños *of the 1970s and early 1980s caused the collapse of the fishing industry and brought floods to many parts of the desert.*

banned in the United States and Europe. When crop-spraying aircraft began venting chemical blankets along the valleys Maria stopped eating fruit and kept to cereals like barley. With her diet restricted even more, she aged and lost weight. But as she said: 'I may work less yet the quality is the same — if not better'.

Although beset by problems, she continued with her investigations and asked for Government help to protect the pampa. From the days of Father Rossel Castro to the irrigation crisis of 1955, there had been talk of a national archaeological monument. Now, with the spaceman story, the need for some protection was greater than ever. The problem was: How? The lines are not a tidy package like Stonehenge which can be fenced or barricaded, and Maria realised that five hundred square miles of desert was open to anyone. Yet something had to be done and even a guardpost and notice board would cost money which, with the Peruvian economy sliding downhill without an end in sight, the country just did not have

One of the negative influences in 1972 was the collapse of the Peruvian fishing industry. For ten years Peru had been in the top league of fishing nations, taking up to twelve million tons of fish per year from an immensely rich coastal current. The mad scramble for fish collapsed abruptly in 1972 when a particularly severe natural change affected the current and the desert climate. Hundreds of stubby hulled seine netters were laid up, many never to go to sea again. It was at this stage that Maria asked the Government for help through the established National Culture Institute and was told there was no money for Nasca. Later, when finally some funds were allocated, they were, in Maria's opinion, 'put in the wrong hands'.

She next turned to America and France for help to finance her own protection scheme. She needed a light aircraft to take the tourists over the pampa to get a good view of the lines. One of her friends could fly and believed

Maria Reiche continued her painstaking measurement of the desert figures until she was eighty.

the tours would ultimately pay for the aircraft. Gerald Hawkins, in his report to the National Geographic Society, had described the gigantic figures in the same way as most other commentators: 'They are too large to be seen effectively at ground level'. So the Society was aware of this fact when Maria approached it for funds. The first response, she said, 'was poor — they said it wouldn't work', and she reflects on the short sightedness: 'They said the flights would be too expensive'. Later the Society offered a grant.

It was hard for Maria to accept, but the truth was that Nasca was remote and something of a curiosity. She was too close to her subject and, while she understood it well, most of her readers were baffled. When faced with outsiders' disbelief of the critical situation, or the sheer institutional lethargy, her reaction was to strike out alone. Her sister, Renate, had always been deeply committed to Nasca and had given financial support over many years. Maria needed her sister's help.

The key, Maria explained, 'is to give the tourists something to see — you have to be above the lines, and people coming here for the first time do not realise that. All they do is walk around in circles looking, marking the desert and discovering their own footprints'. In one letter to the Lima press she was even more emphatic: 'This huge network of intricate — perhaps brilliant — conception is being turned into a network of cart tracks'. *Time* magazine, in

a full page article on the mystery, said 'there is scholarly agreement on one point: unless protective measures are taken soon, the markings may not survive much longer'.

In 1974 Maria began to work towards building a sixty feet high viewing tower, set near the road. From the top platform there would be a panoramic view which she said 'must be free of charge. Otherwise no one will use it'. For funds Maria turned to friendly companies in Lima, to Renate and to sales of her book *Mystery on the Desert.* By Maria's contract with the Corporation for Reconstruction and Development of Ica, the money from sales belonged to her.

The slim volume, superbly printed in Germany in three languages, was so popular in Peru that Maria had on more than one occasion thought of withdrawing it from the bookshops. 'It tells people too much', she said, 'too much attention will be given to the pampa. I'd rather starve than have the pampa destroyed'. Now, with von Däniken's millions of readers asking for more, Maria found she could turn her book sales to her advantage.

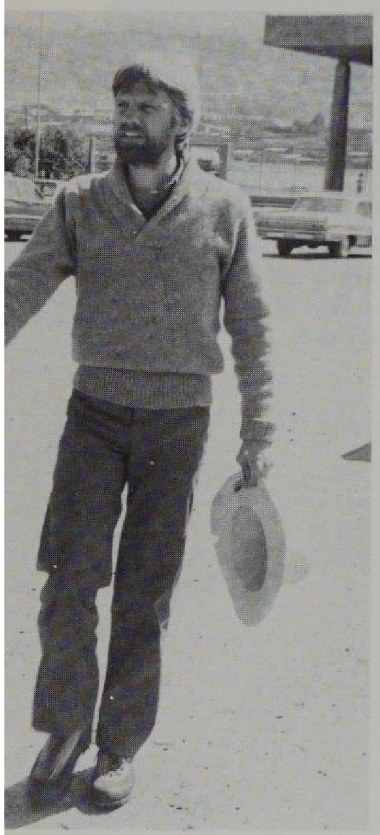
She began selling copies of *Mystery* in Nasca. She always said it would be a bestseller and she sold as many copies as Renate could send from Germany. She soon discovered she had enough money to pay her own watchman and appointed one to guard the San José pampa. But the project soon ran into trouble; the watchman was easily bribed and tourists continued to invade the pampa. Before Maria could fire him he fled. Then, to add to her problems, a poorly reproduced pirate copy of the book appeared in a Lima shop and she had to turn her attention to that.

Protecting the pampa and ensuring the survival of its rapidly deteriorating legacy took all Maria's time. She took time off from this only when faced with another computer challenge. Another expert had surfaced, briefly, in Lima. This time it was a Peruvian Army Major, Luis Mazotti, who thought he could find evidence to prove the lines were essentially a combination of a calendar and an astronomical map. He began to receive publicity in Lima; in turn Maria decided to write some conclusions to her long search for the measurement unit.

She was less than a month off seventy when her story of the measurement unit was published in Lima. Even then it might never have seen the light of day had it not been for her confidence in Peter Frost, a young journalist working for the English language weekly magazine *The Peruvian Times.*

Frost had travelled with Maria on one of her visits to Nasca, and his story continued a tradition of obscure Peruvian-interest themes started in 1913 by C N Griffis, an American pioneer newsman. 'Griff', as he was known to generations of travellers and adventurers, arrived in Peru in 1912 after a money-making job as a rodman surveying the Panama canal. He bought the Lima-based paper *The West Coast Leader,* turned it into *The Peruvian Times* and worked as its editor-in-chief for many years.

The Peruvian Times's story of 13 April, 1973 deals with Maria's step-by-step



Peter Frost, a journalist, became a close friend of Maria Reiche. He was the first to describe the measurement theories.

deductions leading to the measurement unit. It is the only published account, and goes some way to explaining how the large figures may have been made when the builders could not see the finished work. Maria wrote: 'They must have had a clear picture in their minds of what they were to produce'. She continued: 'They would have to draw it on a smaller scale as a model and measure on it the lengths and directions, from which they made much bigger figures. For measuring and enlarging they needed a scale containing a basic unit of length'.

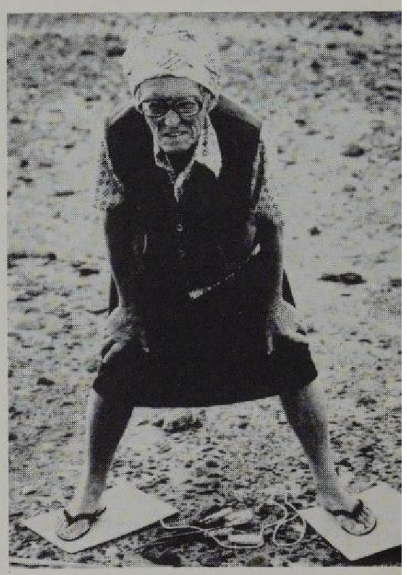
The five-page article described the sisal cord which Maria believes the ancient builders used (sisal being the only yarn which would give an accurate measurement; cotton or wool would stretch). In the early 1970s, Maria considered the unit as the length of cord an ancient Nasca artist would have held between outstretched arms. The cord would then have been used by the Nascas like a draughtsman's compass. With one end held firmly at a point marked by one of the special stones, the free end could be pulled taut from the fixed point and moved to inscribe an arc from a circle on the ground.

Eight of Maria's plans were published in *The Peruvian Times*. One of them gave her explanation for the head of the giant bird at the western end of the Great Rectangle. The continuous curve of the head is not part of a perfect circle but, like many of the other Nasca curves, the artists could have created it by a geometric principle of taking segments from circles of different sizes. As long as the fixed point chosen by the cord holder was laid on the straight side (radius) of a segment, the arc drawn would connect with a neighbouring curve. Thus the curving line would be joined without a break. The sharpness of the curve could be altered to suit the design. 'It's the only way they could have made the continuous curves', Maria believes.

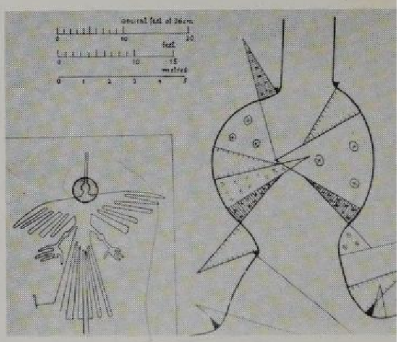
She talked of the smallest details which 'must have had a hidden purpose — the basic elements used in these carefully executed geometric constructions could, for instance, represent numbers'. If they did have some meaning for the Nascas then more studies were needed to decipher the code. And, concluding, she called on Peru as a nation 'to recognise that this profuse assemblage of giant prehistoric drawings, the like of which does not exist anywhere else in the world, must not be destroyed'.

As she made headway with her investigation so the measurement unit evolved and Maria admits that her ideas changed. 'Though only concerning the length of the unit', she says, 'but that's normal — it's a complicated study'. The development of her idea and her constant battle to defend the lines occupied much of the next fifteen months. The Marcona dust haze worsened, though some local experts, like Duncan Masson, suggested the climate was changing due to the vagaries of the offshore Pacific current. The summer heat became intense and sandstorms and rain lashed the pampa.

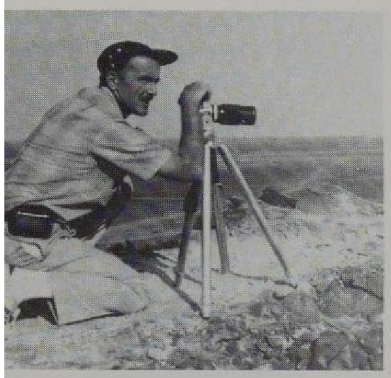
Early in 1974 the editors of the popular *National Geographic Magazine* sent Loren McIntyre, their leading South American specialist writer-photographer,



Maria stands on cardboard to avoid damaging the desert surface.



Using numerous diagrams, Maria Reiche explained to The Peruvian Times *her theories about the construction of the lines. Each curve could have been drawn from a series of arcs taken from different circles.*



Loren McIntyre, photographed here by Maria Reiche, is unquestionably the most experienced photographer of South America.

to Nasca. McIntyre, who had spent half his lifetime 'around the Andes', was as much interested in Maria for her determination as in the lines, and it was McIntyre who persuaded the National Geographic Society to offer her a grant for her studies. Although Maria refused it, on the grounds that it might fall into the wrong hands, she realised that interest from a magazine with a circulation of millions was just the kind of publicity she needed. Then she received more international recognition when Dr Hermann Kern, a writer interested in her art and ancient calendars, created a major exhibition of 'Peruvian Earth Drawings', mostly Nascan, for touring in Germany.

In August 1974 Maria left Peru for Stuttgart — only her third visit to Germany in more than forty years. Her ticket was a gift from the Munich Kunstraum, a gesture which unexpectedly caused last-minute problems at the passport control in Lima. Peru was locked in an economic and political crisis which meant that residents could leave only if all their tax affairs were in order. Maria possessed an expensive air ticket and no tax papers. Her friend Clorinda remembers that 'the authorities wanted an official letter stating exactly what she did in Nasca'. Obviously a difficult request, as Maria had little connection with officialdom, and in any case she was not earning money.

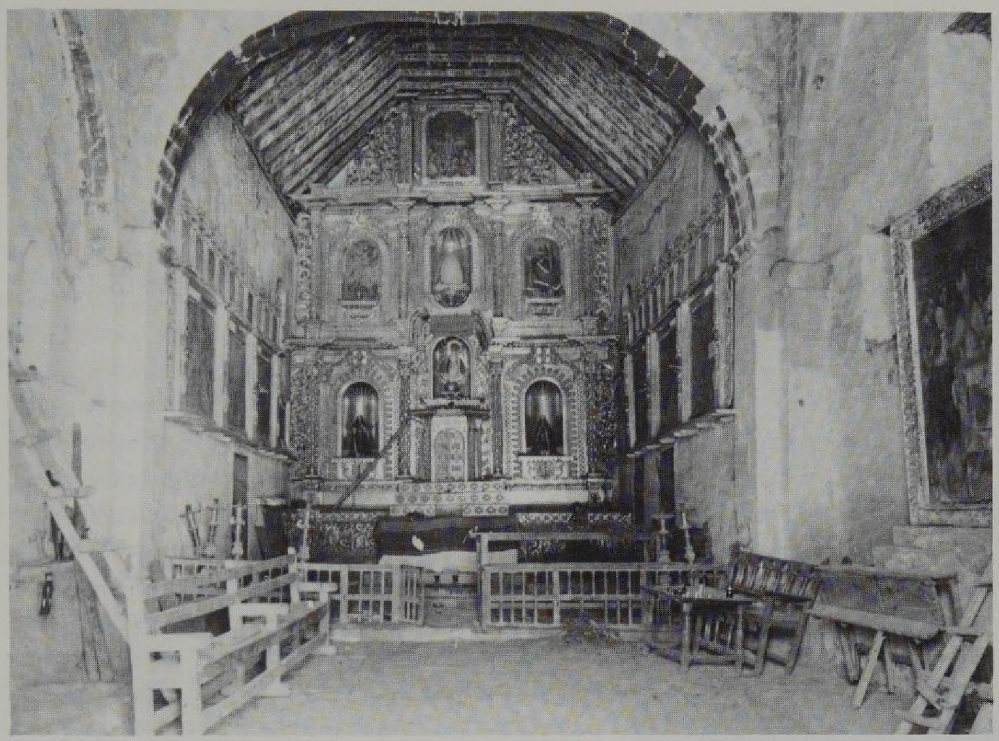
Luckily Maria had a good friend in Dr Luis Lumbreras, the Director of the National Anthropology Museum who, at the last moment, produced a note saying she was 'a scientific investigator whose voluntary work represented an invaluable asset to Peru'. 'Maria was thrilled to bits', says Clorinda.

The exhibition opened in Munich on 30 September at the Kunstraum accompanied by a lavishly illustrated guide. In the Foreword, Hermann Kern gave credit to Maria's long dedication to the lines, pointing out the 'provisional character' of the documentation, analysis and interpretation. 'Maria Reiche until now has not had either adequate material or scientific support'.

Everyone who visited the exhibition could see Maria's work. Massive photo enlargements captured the best of her pictures — the result of hours of painstaking study. Maps and scale drawings of the figures, including her old friend the monkey, attracted just the kind of attention she needed. And the catalogue included a long introduction by Maria explaining the figures, the measurement unit and some of the astronomy.

A lengthy critique by Hermann Kern in the final pages sums up the desert markings, mostly from the artistic point of view. He compared Nasca art with other earthworks, such as the hill figures of southern Britain where pictures were made by removing the turf from hillsides and exposing the chalky ground below; or earthen mound figures including the Great Serpent in Ohio — seen from the air the figure consists of a sinuous body and spiralled tail. These works, like those in Nasca, said Kern 'served no recognisable practical purpose as architecture or fortifications'.

The appraisal then moved on to the vexing problem of 'invisibility' — the



Fine gold leaf decorates the roof of this windowless Andean cathedral. Like the desert markings, the beauty of the ceiling is lost to the mortal beholder.

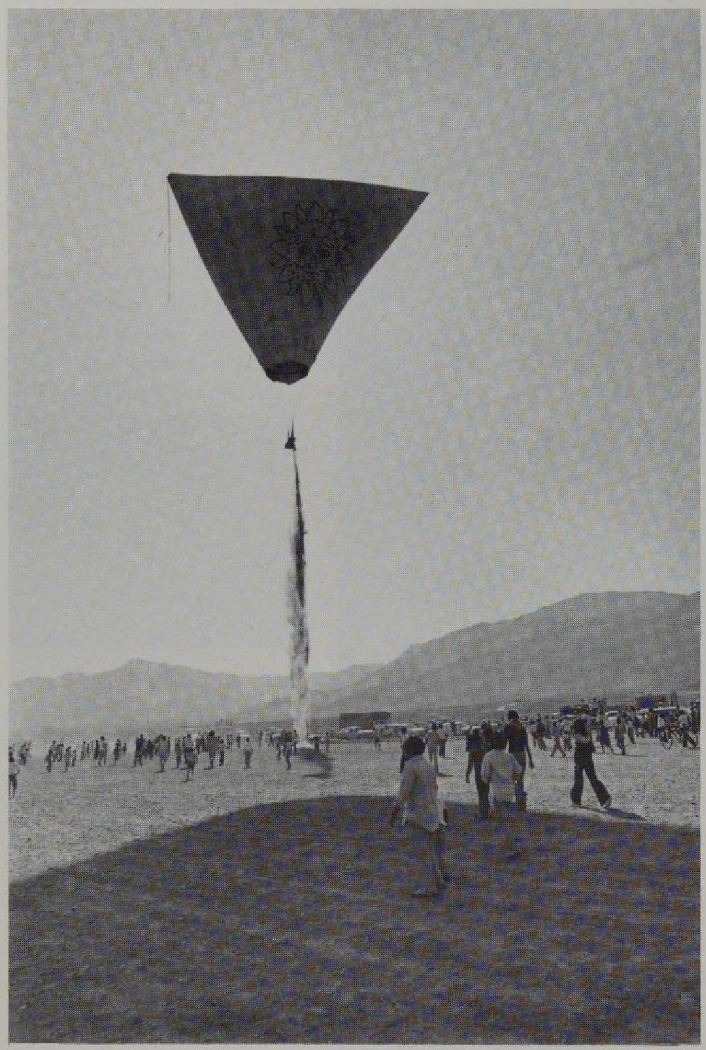
markings are visible only from the air; if seen from the ground they are, as Kern said, 'only in confusing sections with falsifying perspective distortion'. It was this mysterious aspect of the lines which von Däniken used to his advantage and which Kern compared with European concepts. For the first time the spectacular figures were taken out of the desert setting and put in a familiar setting.

The lines 'served some kind of magic-religious purpose', suggested Kern, and he went on to compare their invisibility with religious art such as that in the highest parts of churches: frescoes, highly-elevated capitals and keystones, for example, which could never be clearly seen by the worshippers because of the dim light from candles and through the stained glass windows which prevailed in the days when the great cathedrals of Europe were built. 'The artists concerned were naturally aware of this', Kern said.

On the same theme he recalled hidden numerical references given by Johann Sebastian Bach in some of his religious vocal works. According to Kern, the St Matthew Passion holds many. The score for the words 'My Jesus keeps silent to vile lies' consists of thirty-nine chords, a reference to the thirty-ninth psalm, the tenth verse of which has the words: 'I will be silent, and not open my lips; for Thou hast done it'.

When Maria returned to Peru she found little change, other than even more tourists tramping across the desert. Some protection was imperative. When she had left Peru to promote the exhibition in Germany it had been with the hope that some of its income would go towards the costs of conserving the pampa. She had in mind her tower project and a budding association of influential Peruvians who promised to protect the markings. Then all too quickly the organisation ran out of steam. Shortage of finance and local enthusiasm killed the idea until, once again, Maria was on her own.

Her problems stemmed partly from the distance separating Lima from Nasca. Politicians and influential people were understandably suspicious of anyone who stepped into their territory. And while Maria could be said to



In a long-awaited moment, the smoke balloon rose over the Nasca desert.

'bridge the gap' not everyone agreed with her, for in the eyes of some powerful investors the pampa remained valuable land which could be developed. Compared with a solid farming plan the tourism potential was too uncertain and the best Maria could do was to keep going along her own path while everyone around her argued.

Early in 1975 Lufthansa, the German airline, gave Maria a free ticket to Germany and she used the opportunity to lecture and try to maintain enthusiasm there. But she found it increasingly difficult, perhaps because von Däniken had stolen the limelight, though more likely because she was not adding anything new to her story. Everyone wanted results and measurement units were far too cryptic for most people.

But behind the scenes preparations were in hand for a spectacular adventure which came at just the right moment. Jim Woodman, a forty-four year old American, arrived in Peru with a huge balloon, intent on proving that ancient Peruvians could fly. Woodman, who had received several awards from Latin American governments for promoting tourism, was a Director of the Miami International Explorers Society, founded in 1972, a society which had made Maria 'International Explorer of the Year' and presented a thousand dollars for the protection of the pampa.

The scheme was taken in good spirit by the local press giving publicity to the lines. Woodman and his Lima-based partner, Mike DeBakey, drew on ancient legends which suggested to them that balloons had been used in South America long before the French brothers, Joseph and Jacques Montgolfier, made their first ascent in 1783. Ancient Nascas with balloons could have directed line building by calling instructions to workers on the desert below — or that was the theory.

But what of the balloons? The desert preserves everything yet the graves of the Nascas are not filled with the desiccated remains of balloon cloths or gondolas. Even so, the explorers were convinced that the Nascas could have made the cloth for balloons which, they said, could have been lifted by hot air generated by fires on the pampa. Woodman explained how the fires could have been made in special 'burn pits', now seen as piles of blackened stones which

are set at the ends of lines or in the great clearings. These stone heaps, which have a simple, central depression, are the same as those reported by Toribio Mejía, Maria and Gerald Hawkins, and referred to by Hans Horkheimer as 'earth ulcers' in Chapter 2.

Mike DeBakey said analysis had revealed that stones of the pits had been subjected to intense fire; more evidence for the explorers' theory — all that was needed was to test it. Condor I was a smoke balloon made in the United States, and Woodman and DeBakey explained that its fabric matched samples taken from the Nasca graves. The principle for flying such balloons, according to Woodman, involved smoke particles filling the pores of the cloth thus allowing the envelope to fill with hot air and rise. The passenger-carrying gondola below Condor I was formed from traditional reed-boat bundles made by Indians living beside Lake Titicaca, the world's highest navigable lake 12,500 feet high in the Andes mountains.

Jim Woodman and Mike DeBakey gathered their team on the Nasca desert in November 1975. They had invited the record-holding balloonist Julian Nott from Britain to be the balloonist alongside Jim Woodman. Nott, who had earlier seen the balloon and its porous fabric, reckoned that from his experience it 'probably wouldn't fly at all'. But after some near mishaps with the flames from wood fire, Condor I rose majestically over the Nasca desert.

Julian Nott called the flight 'magic', and the Reuter's correspondent said 'it was the most remarkable story I have ever covered'. Television news worldwide showed beautiful scenes of the ninety foot high balloon drifting across the desert from a pampa some distance away from the precious San José. While archaeologists shuddered once more at another popular theory and its spectacular presentation, Maria, as Nott said 'fell right out of her tree'. She was thrilled.

Asked to comment Maria told the press: 'I am certain the early Peruvians flew. I wept with emotion'. For a short while the pampa was getting the kind of attention she liked. 'It is the culmination of my work', she announced happily.

One of Mike DeBakey's business interests in Peru was a tour company, and following the ballooning experiment he set about promoting Nasca tours. The demand from overseas was sufficient to get a small air taxi company involved with a Nasca 'over the lines' service using light aircraft. The idea of keeping tourists off the lines was, quite literally, taking off. Maria completed her view tower, though not without a typically farcical controversy concerning ownership and rights — particularly regarding the profit to be made by charging for entry. Maria prefers not to discuss the matter but she has confirmed that 'while I'm alive the tower will be free'.

The tower was built in Pisco, a coastal town north of Ica and, with the help of Maria's Airforce friends, was lifted to the pampa by transport helicopter. The road route would have been impossible for the giant steel assembly

Television worldwide carried news of the flight of the balloon, Condor I. With a balloon like this, the markings could have been planned from above. Julian Nott and Jim Woodman sit astride the reed gondola.

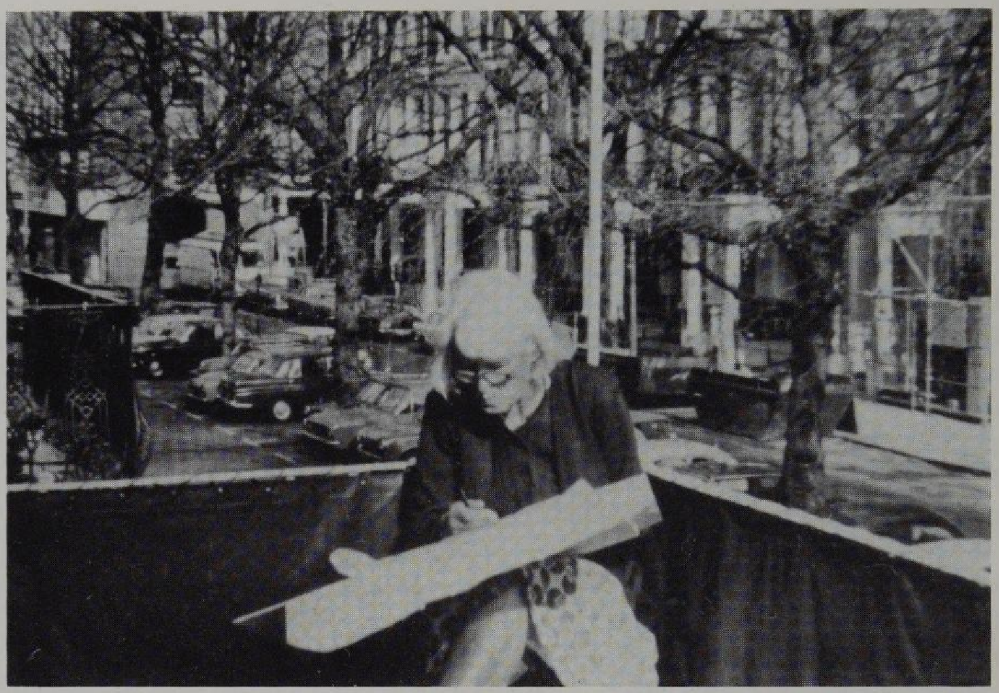
because it could not pass through the tunnel at Santa Cruz above the Rio Grande. Once the tower was positioned, Maria and Renate raised even more money for a second guard to keep watch and bought him a motorcycle to chase intruders. The National Cultural Institute declared the San José pampa a protected zone and erected notices to this effect. For the first time for five years Maria could return to her measurement unit with the comforting thought that protection of the historic desert had started. She was seventy-three.

At the time of her next birthday Maria was invited to lecture in Britain. The visit coincided with a tour of Dr Kern's Munich Kunstraum exhibition opening in London at the Institute of Contemporary Arts. The venue, which has a reputation for 'fringe' exhibits, was the choice of the Arts Council sponsoring the tour, and visitors could expect to see anything from sex art to sensitive pictures of stone circles. Maria took the scene in her stride, arriving in fine weather when the plane trees outside in The Mall to Buckingham Palace were at their Spring best. Renate came from Germany for the first night and Maria's lecture. After the publicity both of the balloon flight and of von Däniken, Maria faced a tightly-packed audience.

Adding to the sense of occasion was the upsurge of interest in 'earth magic' — or curiosities of sacred places and unusual sites in the British countryside. One of the beliefs was that these places, imbued with 'some unknown power', could be found on invisible straight lines known to their followers as leys. For most professional archaeologists such territory was pure quicksand; they mentioned leys only when out of hearing — and preferably out of sight! — of their colleagues. Thus to have Dr Warwick Bray, a leading archaeologist and South America expert as chairman at the first night's lecture, was indeed a coup.

The London lecture captivated a lively audience. With Stonehenge being relatively close the questions turned to astronomy and the conflicting ideas of Maria and Gerald Hawkins. Maria found she was among friends who laughed and applauded as she put her case against the astronomer. She said that Gerald Hawkins had worked from an 'incomplete — very accurate but incomplete — map, which the Government made at the time, so I don't think his arguments have any value'. Gerald Hawkins's main area of investigation was the pampa of San José which is densely packed with lines. The audience clapped when she explained 'you can see the density of the lines declines in accordance with the distance from the edge of the desert or the distance from the dwellings in the valleys'. Maria was referring to lines near the old Nasca settlements. Put simply, she holds the view that the 'Hawkins result' was biased in favour of the lines in the San José pampa which is near the valley.

On the matter of Stonehenge it was left to Warwick Bray to draw a comparison with Nasca, though he spoke more about the investigations as to why the stones and lines were made. Then, in the manner of a good chairman, he drew together many of the opposing points and left the audience enthralled,



Maria Reiche in London, 1976. After the initial publicity surrounding her visit, Maria travelled throughout Britain to see Stonehenge and other circles of standing stones.

though possibly as baffled as they were at the beginning.

From the media point of view, Maria's lecture at the Institute was an event not to be missed. For some time I had been planning another Nasca television film, though an accident in Bolivia in 1971 had put me in hospital and off the desert for three years. On my one brief return journey to Nasca in 1974, I had been unable to find Maria, who was 'out on the pampa', so her appearance in London was a welcome reunion. It was also the right moment to put another plan to the BBC.

The idea hinged on a discovery I had made some years earlier. Marion and I were travelling in the remote Andes of Bolivia when we found a hilltop Indian sacrifice. The bones of a guinea pig lay in the ashes of a stone shrine and, looking down from the hill, we saw lines — all straight and some very long — which appeared to converge at the hearth in front of us. Remembering Maria's account in her first *Mystery* book when she described centres of radiating lines, I felt there could be some explanation which might have a bearing on the Nasca riddle. The new television film, supported by Bayerischer Rundfunk, Munich, turned into an investigation to last almost two years.

Maria stayed in Britain for two months. Over a large picture of Maria, *The Daily Telegraph* proclaimed 'Riddle of Desert Drawings Solved after 2000 Years', and described the geometry and measurement unit. Then, in a second article published after she had visited 'seventeen stone circles' between Land's End and Scotland, *The Telegraph* announced boldly 'Stonehenge Link With Peruvian Desert Riddle'. The link concerned the actual length of the measuring unit which Maria said was used at Stonehenge, at other British circles and at Nasca. She said the unit 'was about 53 inches with slight geographical variations due to the different arm lengths of the builders'. Like the invisible ley lines, the so-called Megalithic yard of Professor Thom appeared frequently in press reports at the time. Maria had talked with Thom's family when she was in Scotland.

At one meeting with Maria on her return to London, I was introduced to Ralph Hewins, a retired journalist who was preparing her biography. Ralph,

a brilliant raconteur, had spent much of his life as a correspondent for *The Daily Mail* and had made friends worldwide. He soon became a devotee of the lines story and we spent many hours considering the opposing theories, with Ralph smoking and making copious notes on the inside of flattened cigarette packets. He grasped the problems confronting Maria and became her greatest press supporter. She then returned to Peru and the three of us did not meet again until the following year. The filming had started and Ralph joined the crowd as we gathered on the desert near the San Pablo storehouse.

The loneliness of the pampa had vanished. Tourists were clambering up the view tower and light aircraft made half hourly sorties over the monkey. We heard from Maria that we were not the only writers and film makers about. Canadian TV, Japanese TV and another BBC team were in her diary for that year. *Time, Stern* and the new lavishly illustrated *Geo* from Germany had sent journalists. From France, Simone Waisbard, well known for her studies of South American archaeological enigmas, was putting the finishing touches to her book.

Maria became the star of Nasca, and the spaceport of lines made the news. She regarded the attention with mixed feelings and was only happy when she saw the pampa empty, often bemoaning 'all these visitors we see now could ruin it in a few weeks'.

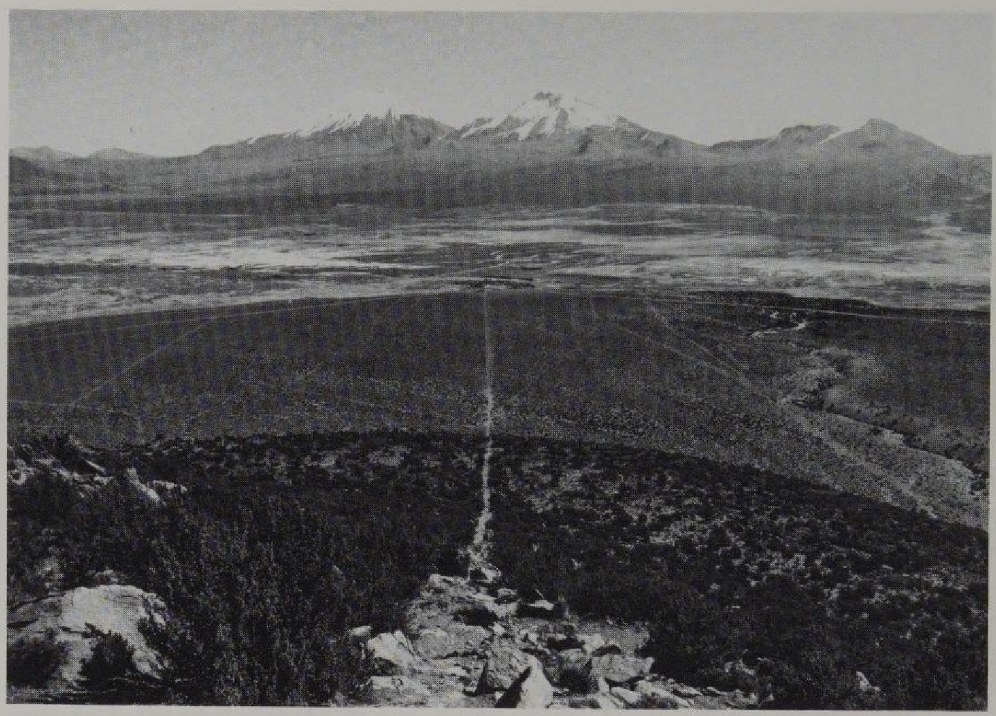
But her travelling, the years of poor diet and her growing concern about polluted food had left her tired. She was in her seventy-fourth year and, since the end of World War II, she had thrown herself almost non-stop into solving the desert mystery. Her effort did not go unnoticed in Nasca which was enjoying the benefits of expanding tourism. In return for occasional lectures to tourists, Maria was given a free room by the manager of the local tourist hotel. She left her room in the San Pablo storehouse to her papers and mice. 'The mice were terrible', Maria remembers, 'they ate everything including my notes. Once I killed seventeen'. She quickly took to her new style and chatted about the pampa and its preservation to many guests including VIPs from around the world. Her impact was quiet, determined and very positive, so much so that in late 1977 the Peruvian Government honoured her with The Order of Merit for Distinguished Services.

Soon afterwards two television films were shown on BBC and later in Germany. The first, by a few days, was 'Pathways to the Gods', based on my own investigation of the straight lines in the mountains. My first step was to discover the direction of these lines and I discussed the problem with Maria. While she knew of other lines in the desert of Peru, she was keen to learn more of the mountain sites, though mostly how they might relate to her unit of measurement. She wrote to her old friend Clorinda: 'Mr Morrison, the English gentleman, has found out that there are lines and tracks all over Peru, and this is true. I asked him about measurements but he wasn't interested. When he started his work I asked him if he would measure the length and

Daily Mail *journalist Ralph Hewins with Maria Reiche, 1977.*

Simone Waisbard, whose book Les Pistes de Nazca *received great acclaim when it was published in 1977.*

Maria Reiche with BBC senior cameraman Ian Stone, and sound recordist John Hore.



Swiss adventurer Aimé Tschiffely found lines like these in Bolivia leading to hills and said 'they were absolutely straight and very steep. . . a white man would find it difficult to reach the top'.

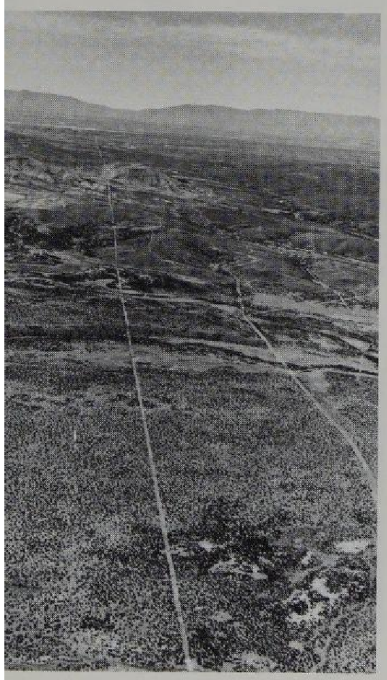
direction of the lines but he refused'.

Lines of the kind that interested me were reported in the early 1930s by two travellers to the remote highland deserts of Bolivia. One account came from the renowned French anthropologist Alfred Metraux who was studying the 'cult of the mountains' — all the spirits and kindred gods which, according to Indian myth, inhabited hills and a variety of other features. Metraux talked of 'paths in the deserts which converged to sacred places like the spokes of a wheel'.

Similar lines were seen at about the same time by the Swiss traveller, Aimé Tschiffely who journeyed from Buenos Aires to Washington on horseback. His classic story of the 10,000 mile adventure — *Tschiffely's Ride* — appeared in 1933 and includes an account of Indian shrines or chapels on hilltops overlooking certain villages. The paths leading to the shrines 'were invariably absolutely straight and very steep, so steep in fact', wrote Tschiffely, 'that a white man would find it difficult to reach the top'.

All the straight paths I found led in a random variety of directions, usually to hills or stones. None of them appeared to point to any solstice or important sun position though, as I explained to Maria later, I checked only a few. I explained the most likely solution to these lines in a book which followed the film. The randomness of the directions lay in the Indian mind; even a sun line need not point to a solstice — it could lead to the horizon marker for the sun's rising point on any sacred day, even the birthday of a chief. Solving that kind of puzzle would be beyond even a modern computer, as so much of the information died long ago with the people who made the lines.

The directions of the lines were just another part of the story, while the mountain paths were complete with many Nasca-like features, including heaps of stones and scattered broken pottery. Moreover, the mountain people knew of the religious tradition involved which, in 1939, had prompted Toribio Mejía to suggest sacred paths as a solution. Thus, although the connection I forged between the Nasca lines and those in the mountains is sometimes complex, the



This straight path crosses an arid wilderness in the Bolivian Andes.

idea was received favourably.

The second television film from the BBC examined the claims of von Däniken in 'The Case of the Ancient Astronaut'. Von Däniken had followed his first bestseller with others, including *In Search of Ancient Gods* in which Nasca appeared jammed between pages of pyramids, standing stones and worldwide legends. In a skilfully directed ninety minute epic von Däniken was asked to comment about how one of Maria's own pictures — the leg of the giant bird — had appeared in one of his books. The caption to the picture read: 'Reminiscent of the aircraft parking bays on a modern airport'. Erich von Däniken accepted the mistake by explaining that his editors were responsible. But then what of his idea of the Nasca lines as runways?

The director pointed the camera to his team as its vehicle stuck in the soft dust. The wheels churned a choking yellow cloud. Would it make a good runway? the commentary asked, apparently overlooking the fact that an aircraft landed in the same place during a Gerald Hawkins expedition. But Carl Sagan, the American astronomer and television personality retrieved the situation. Dr Sagan was invited to comment on some of the interviews, and he asked his audience if they could believe that any space ship capable of crossing millions of light years of interstellar space would need a landing ground. Such thoughts, Sagan said, 'were a kind of temporal chauvinism'.

Towards the end of the 1970s the tempo at Nasca changed again. The lines were an established tourist attraction and Maria, approaching eighty, was kept busy. Guards had to be found — and paid. Tourists and reporters always needed her views. Her work on the pampa continued, often with the aid of assistants, mostly students, who helped with the revision of the length of her unit of measurement. At times, Maria admitted privately that she was tiring and looking for someone to take over the work. 'But it has to be a person who is prepared to live here and not just stay a few days. The pampa needs patience'.

Such a person was hard to find so, in spite of deteriorating eyesight due to glaucoma, Maria determined to continue alone. She was comfortable in the hotel and respected by the people of Nasca. After almost forty years, the *doctora* Maria Reiche had become one of them and put their town on the map. Perhaps her one regret, which she shared with Renate, was her biography, for Ralph Hewins had fallen ill and his writing, which had slowed down, finally stopped.

When asked if she will write her own story Maria usually responds, rather shyly. 'No publisher would dare publish what I have to say!' Or she simply passes over the idea with a wry comment about 'after I'm ninety'. When a French television producer created a film based on her life and applauded her as 'The Lady of Nasca', the fame led a reporter to announce her death. But Maria Reiche was not ready to join the Nasca spirits. 'I had to write to the publishers and tell them I was still alive. How stupid!' She still laughs at the joke.

CHAPTER 8

Success and Successors

Nasca had never seen such a party. Flags were out and the tiny central square filled with a festive crowd. Speeches were the order of the day and *Life* magazine sent a photographer. Maria Reiche was eighty-one and the people of the town honoured her by giving her name to a school and a street.

Would the 'lady of the lines' retire after more than forty years of painstaking work? questioned a reporter from *El Comercio*. 'Retire?', Maria responded. 'How can I retire? There's still a lot to be done and all the time I can think I can work'. Yet Maria knew she was at a crossroads with time and her health against her. For some years she had suffered from Parkinson's disease and the symptoms were worsening. Her eyesight, too, was failing with other troubles compounding the effect of her long-standing short sight. She relied heavily on assistance from two young Peruvians, Benedicta Morón and Lucio Calle, who even carried her to the desert. Benedicta was schooled in geometry by Maria and with Lucio she continued to make all the measurements and drawings Maria needed. 'They are the best help I've had', Maria said.

From her work at this time, Maria once again revised her opinion about the 'measurement unit' which had sapped her energy for more than thirty years. One of the figures — the 'bean sprout' — was the key according to Maria. 'The curves are made from a series of arcs of circles incorporating the unit of thirty-eight centimetres, and the unit appears in each radius in multiples of seven'.

Maria has often spoken of the significance of seven as a 'mystic' number, and its prevalence in our everyday-seven-day-a-week world. The apparent preference of the human mind for grasping 'seven' has been debated for many years. Arguments for the case usually begin with the seven deadly sins, the seven wonders of the world and, from the Bible's Book of *Proverbs,* the seven pillars of wisdom — all due, according to some numerologists, to certain groups of bright stars in the firmament impinging their 'seven' image on the brain. Among the principal contenders for this role of collective subliminal imaging are the seven sisters of the Pleiades and the seven brightest stars in Ursa Major — the Great Bear or Plough.

'Seven, fourteen, twenty-one and so on multiplied by thirty-eight centimetres can be found in the figures', Maria explains. 'The unit itself is the distance between the thumb and the elbow and was probably made by stretching a cord as sailors measure their ropes'. She called her unit the 'el' which, as she said, 'is a very old word for measure of length'. The word elbow itself is derived from 'eln' — an archaic word meaning forearm, and 'bow'. Maria has never written her theory with examples, though her thoughts about the 'bean sprout' were first presented in 1983 through a specialist travel magazine *The South American Explorer.* South African born writer Michael Spencer found a rapport with Maria and she gave him the details and diagrams for the article. It followed the style established by Peter Frost of *The Peruvian Times,* although the 'bean sprout' theory was left incomplete. Maria decided to concentrate her efforts on understanding a spiral.

By her eighty-first birthday Maria Reiche had developed her new theory still further and it was aired in *The Lima Times,* the successor to *The Peruvian Times.* Interviewed by senior reporter Vanessa Baird, Maria said she had made a 'crucial new finding. . .the circumferences of the figures represent exact time spans — the ''bean sprout'' is exactly a calendar month, and another drawing, the true ''key'' on the pampa not far from the humming-bird, is 365 days, exactly a year'.

On the question of these measurements, Maria has faced little criticism. Most of her challengers have been too preoccupied with lines and astronomy to have time for deciphering the riddles of the drawings. And Maria Reiche has had the advantage of working on the pampa which is now closed to all but a few trusted investigators.

Knowing her sister's determination to continue her work Renate, who had retired from her medical practice, began to spend more time in Nasca where she could supervise Maria's Parkinson's disease. Maria was insistent on using local herb remedies but Renate was not so sure. In her extremely successful career in Germany she had specialised in homeopathy and she began to treat Maria following this system. By the end of 1984 the disease was coming under control and Maria continued with a heavy work load of interviews, lectures to hotel guests and flying over the pampa whenever she had time.

But her eyesight problems dogged her work, and early in 1985 she travelled to the States for consultations, where specialists at the Bascombe Palmer Eye Institute, Miami, offered free treatment in recognition of her work at Nasca. By then Maria had received more honours and awards in Peru, including the Congress Medal of Honour. Much to the concern of everyone who knew of her dedication to Peru and the mystery of the lines, the prognosis for her sight was bad: the specialist had said her eyes could not be improved. 'I will have to accept it', she said calmly, 'I should have taken more care in those early years on the desert'.

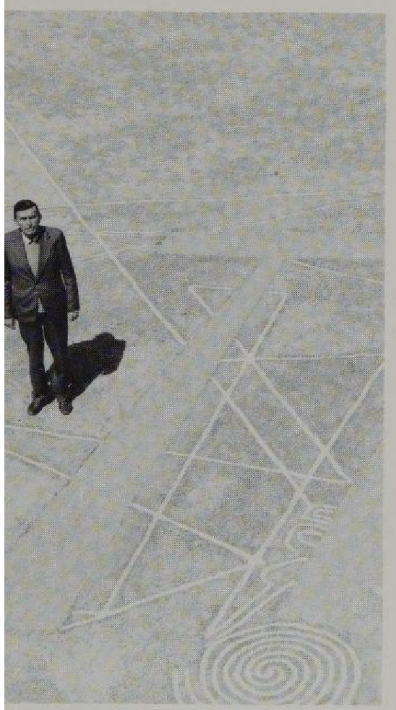
In the wake of world-wide publicity on the lines, Nasca was changing. The

The nightly talks at the Tourist Hotel are a major attraction in Nasca.

Tourist Hotel, Maria's home, was enlarged and modernised. Restaurants and bars opened overnight. Julio Fernández, who as a young man had held Maria's ladder, found his small family hotel bursting at the seams. 'The whole world is here', he said, 'and all because of Maria'. The word went about that Maria personally met visitors in the Tourist Hotel and most evenings she gave a long, informal talk in three or four languages. 'The question times afterwards are my favourite moments', she says.

In recent years the questions have been focused on the purpose of the lines and clearings. 'There have been so many ''solutions'' I can't keep count and usually they do not have a foundation in mathematics anyway', says Maria. But Dr Alejandro Pezzia, an archaeologist and Director of the Ica Regional Museum, has tried to keep a list. 'It's very long', he says 'and I keep revising it'.

According to Pezzia 'People relate the lines and figures to the stars and Zodiac signs. French people particularly think they capture a mysterious energy. One writer, Robert Charroux, wrote a book which is as famous as von Däniken's'. Dr Pezzia's list is displayed in his museum and he has built a simplified plan of the lines in the garden. He explains the theories succinctly: 'Jack Waisbard favoured an astronomical connection and Henry Stierlin, who lives in Switzerland, thinks the huge cleared areas and long lines were used by the weavers of the burial cloths, some of which are over twenty metres long and must contain many kilometres of thread'. To prepare that amount of thread, Stierlin believes they constructed special courts for spinning.



Alejandro Pezzia, Director of the Regional Museum at Ica, has built a simplified plan of the markings.

Alejandro Pezzia seldom comments on the strength of each case. He prefers not to take sides. 'In 1980 Zoltan Zelko, a Hungarian mathematician, came here with a Hungarian Television film crew'. Apparently Zelko said the lines represented a large scale map of Lake Titicaca in the Andes. 'The markings show the trade routes between the Nasca culture here and the Tiahuanaco culture on the other side of the lake'.

Peruvians, too, have not been lagging behind with theories. Local archaeologists tend to be cautious and veer towards thoughts of ancient rituals with some connection between Nasca style art and the desert patterns. But whatever the theory the case remains unsolved.

One of the problems lies in the evidence. Tens of thousands, possibly millions of words have been spoken by the various investigators but precious little has been put on paper. And, more importantly, most theories quickly dissolve into speculation as supporting evidence breaks down under examination. The most detailed scientific investigation published to date remains the work of Gerald Hawkins, the astronomer. Yet even he was unable to give a date or purpose to the lines.

As well as creating the most accurate published map of the San José pampa, Dr Hawkins checked the age of pottery fragments he found on the lines, hoping that dating the fragments by their design styles could give a clue to the age of

Maria Reiche, aged eighty-three, with failing sight and a damaged hip, continues to walk the San José pampa.

the lines. But in his report he explained why he was wary of the pitfalls of any assumption that the pottery had been cast on the ground by the line builders. The most Dr Hawkins could say at the time was that the majority of the fragments he found came from vessels made about 250 BC.

Recently another extensive survey of the pottery fragments has been completed by a graduate student, Persis Clarkson of the University of Calgary. Persis Clarkson's survey seems to indicate a later date — around AD 900 for pottery on the larger lines.

A great step forward would have been made if Gerald Hawkins's computer had found lines directed to star positions of roughly the same date as the pottery fragments. Instead the computer found only a few lines with a direction towards stars, sun and moon. In the eyes of astronomers these could not add up to a fully fledged astronomical purpose for the lines. So what did they mean?

But even a dead end in an investigation can have significance. Sir Arthur Conan Doyle's detective hero Sherlock Holmes, when faced with a similar dead-end problem, said: 'When you have eliminated the impossible, whatever remains, however improbable, must be the truth'. Does the dictum work for Nasca? In 1968 when I was with Gerald Hawkins on the Great Rectangle, he said in a throwaway fashion: 'You can call it the Plaza of the Pleiades if you want to'.

The astronomer's computer had found that the mounds of stones at each end of the Great Rectangle's clearing would have been in line with the rising of the Pleiades in AD 610. In statistical terms this was simply a chance alignment, and so easily it could have been one of the 148 programmed line directions which did not consistently match places on the horizon where certain stars could have been seen over a relatively short time span. For an astronomical theory to be fully watertight a substantial number of lines would have to match such star positions within a span of perhaps as little as a century, or possibly four or five generations of line builders.

Then, on the other hand, while 'perhaps' and 'possibly' are too vague in science, the line builders may not have been very accurate. They may have simply pointed a line in the general direction of a relatively large area of sky, possibly

where they saw a constellation.

While seemingly soulless, Gerald Hawkins's computer result for the Great Rectangle was confirming what Maria Reiche had said simply in *Mystery on the Desert* in 1949. Possibly to her cost Maria has never followed up her case in print, at least not with sufficient detail to convince academics. When he referred to the Great Rectangle in his report, Gerald Hawkins said it was the 'only identifiable feature for which an astronomical alignment had previously been computed'. The rider 'identifiable' sums up one of the problems; locations mentioned in Maria's books are often hard to find.

In her early years on the pampas Maria had noticed how lines often many miles apart had similar compass directions. She remarked that these lines have a direction which matches, within two degrees, a point she felt indicated positive similarity but which Gerald Hawkins could not confirm. In her first *Mystery on the Desert,* Maria cited eight lines with directions towards the rising place of the Pleiades — 'between AD 500 and 700'. Unfortunately, Dr Hawkins could not locate these lines and was unable to check them as Maria was in Germany at the time.

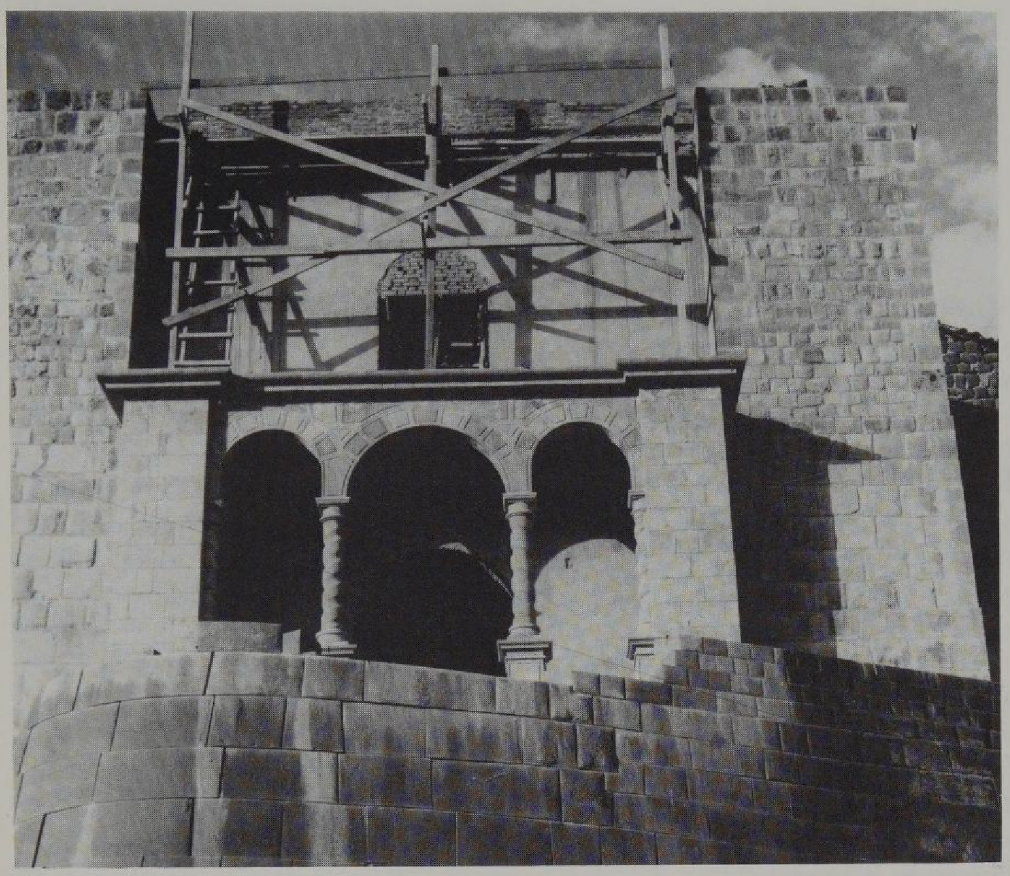
In the case of the Pleiades lines discovered in the 1940s, these are widely separated, with the most northerly being near Palpa and the southernmost at Cantalloc. On the other hand, Maria Reiche pointed out quite clearly 'the importance given to the Pleiades by the ancient Peruvians'. The stars and their place in Andean mythology were known to Spanish writers noting local lore soon after the conquest. One author, a priest, recorded how the Indians waited each year for the appearance of the Pleiades. He wrote: 'If the stars rose large and bright, the crops would ripen well; if they were small, the people expected to suffer'.

Dr Tom Zuidema (left), known for his studies of the radial arrangement of shrines around Cuzco, with Ralph Cané, an aficionado *of the 'lines mystery'. Cané, from Chile, worked on the problem with Duncan Masson.*

It is this extremely sensitive level of perception which has set Maria Reiche apart from the computer. With experience of years alone under the stars and months with Indians in the Andes, she may have got close to the solution. Gerald Hawkins, too, realised it was beyond the computer 'It's not astronomical. It's in the Indian mind', he said.

This remark opened the door for a fresh and less rigid approach. Toribio Mejía's suggestion that the lines were sacred roads was one I followed in the 1970s. Much of my enthusiasm stemmed from Toribio himself and from Dr Tom Zuidema of the University of Illinois. 'It's an Andean problem. Don't look at it from a European standpoint — think Indian'. This was their message and Maria Reiche had often said the same, particularly on the level of Indian astronomy and the agricultural year.

Dr Zuidema is best known for his profound knowledge of the organisation of the Andean Indian society in the Inca days of Cuzco. It may seem a far cry from Nasca, but the Zuidema plan of shrines attended by Cuzco families resembled the spokes of a wheel, the paths between shrines being the 'spokes'. Moreover the plan made a striking visual parallel with the starlike centres at



The Spaniards built their church of Santo Domingo, Cuzco, on the platform base of the Inca Sun Temple or Coricancha. From the Coricancha as a centre, a system of roads or 'lines' spread out into the nearby countryside. These 'lines' were known as ceques *and each linked a number of shrines. This picture, taken in 1961, records the rebuilding of the church after it was severely damaged in the 1950 earthquake. The Inca wall at the base was virtually unscathed.*

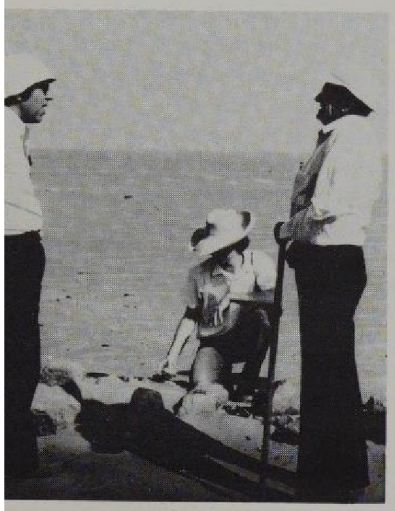
Nasca which Maria found in the early days of her work. The entire sacred arrangement in Cuzco was set around the magnificent Temple of the Sun and drawn as a diagram by a Spanish priest soon after the conquest of the Incas.

After numerous visits to Cuzco and distant parts of the Andes I found many relics of this distinctive radial organisation of shrines. Sometimes the shrines were still being used and frequently they were simple, usually stones, hills or springs — all typically Andean clues I had come to watch out for. In many ways the plan of one of these shrine systems could be laid directly on a Nasca star centre, but as certain of the links are tenuous I have been wary of speculation.

In 1977, the year I completed my investigation, Dr Anthony Aveni, an astronomer from Colgate University, Hamilton, New York, travelled to Nasca with Tom Zuidema. They had worked together in Cuzco and concluded that the radial system of shrines around the city had been arranged by the Incas as a calendar. Not all experts have agreed on this matter and Dr Aveni has since completed several seasons' research at Nasca. Not surprisingly the Nasca starlike centres, where many lines meet, commanded Tony Aveni's attention and he carefully mapped sixty-two of these remarkable features.

Just as Maria observed over thirty years ago, Dr Aveni has noticed how one centre is connected to another, often by long lines. In 1949, in *Mystery on the Desert,* Maria described them thus: 'Many of these lines are connecting lines leading to other centres at distances of up to five miles'.

In his investigation Tony Aveni measured many of the lines and cleared areas confirming Maria Reiche's work, as well as another point she had made. Maria has said: 'Many of the clearings have similar dimensions. . . measuring ropes may have been employed, being carried from place to place'. By 1983



Dr Tony Aveni (left) talks with Duncan Masson during his 1982 research season at Nasca.

Maria had classified the clearings into three lengths of 437, 874 and 1,748 yards. Dr Aveni also noted how the dimensions of the clearings are often similar.

Soon afterwards, in June 1984, with assistance drawn from the American foundation Earthwatch, Dr Aveni, like Gerald Hawkins and Josué Lancho with his schoolboys, set out to discover how long it would take to clear a patch of desert. In each case the experts cleared relatively small areas and then used their results to calculate the time needed to clear a larger space. The results were to prove that the lines and clearings were not in themselves prodigious engineering feats.

Gerald Hawkins's team would have taken 21,000 man days — almost twice as long as Tony Aveni's — to clear a square mile. In a race, Josué Lancho's team would have been second. (But Josué stresses that these academic Olympics were conducted on desert destined for building near Nasca. The historic desert was not affected in any way.) The conclusions drawn are similar. The Nasca Lines are not in the same engineering league as the Pyramids of Giza.

From his research Tony Aveni concluded much as Toribio Mejía had done — that the patterns were paths between sacred places. That much, too, was my interpretation, and even Maria had once called them 'ornamental pathways'. But from Dr Aveni's research a new twist to one of Maria's theories is emerging. Maria has always said that the markings were made as a calendar to predict the arrival of water in the seasonally dry rivers. Proving this has always been difficult, particularly in the extremely precise terms demanded by astronomers.

Reporting in the magazine *Archaeology* in 1986, Dr Aveni explained how he had found many similar features at the 'line centres — they bore an uncanny likeness to one another'. Dr Aveni believes there is sufficient similarity to these line centres and the radial system of shrines around Cuzco for the line centres to be an earlier archaic form of radial shrine arrangement. In which case the Nasca lines could contain similar calendrical elements to the Cuzco system he studied with Dr Zuidema. Additionally, when Dr Aveni came to study the trapezoidal clearings of which there are many, he found that about two-thirds of them have their axes orientated along water courses with 'the skinny ends pointing upstream'.

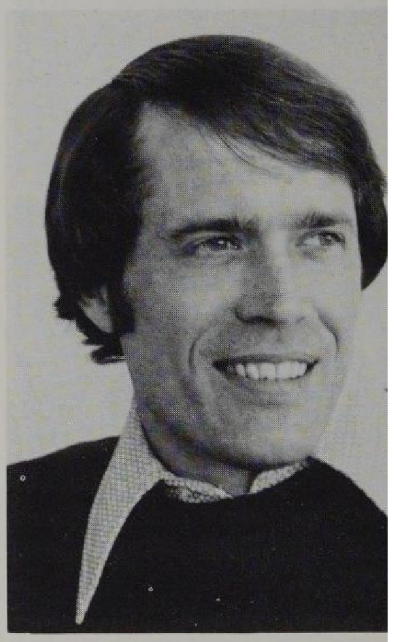
At least there seems to be some support for Maria Reiche's contention that the lines gave notice of the changing seasons to an agriculturally dependent population. Forty years ago, when she watched the coastal people looking eagerly over the parapets of bridges, she said 'they were waiting for the arrival of the *aguita* — the ''little water'' as they endearingly called the annual torrent of the river'. Certainly the thoughts of anyone living in Nasca today turn towards water problems, particularly as December approaches. In some years the Nasca river floods, and at least once within my experience Palpa has been

Dr Johan Reinhard, one of the 'new generation' of 'lines' enthusiasts, is a skilled mountaineer. Johan discovered Indian offerings to the mountain 'water' god on the summit of the Cerro Blanco sandhill.

inundated. You could swim down the main street.

When, over four hundred years ago Spanish writers made a list of the shrines on the spoke-like arrangement around Cuzco, they recorded how more than half were connected with water. The historical account mentions springs with offerings of shells and small stones, a tradition which has survived to this day in parts of the Andes. Mountain people still talk respectfully of 'water spirits' controlling the rains and water flowing in irrigation ditches. Maria Reiche's description of the desert pampas with their heaps of stones 'marking special places singly or in twos and threes' may be said to mirror the form of simple Andean shrines.

This avenue of investigation has been vigorously pursued since 1980 by Dr Johan Reinhard, a skilled mountaineer, who has climbed crags all around Nasca and found sea shells and other offerings there. He even scrambled, 'two steps up one down' as he says, to the top of the 6,800 feet high Cerro Blanco sandhill. There, on the summit, he found offerings which had been placed recently on the ground. 'They were put there by the valley people hoping the mountain spirit would break the long drought', Reinhard says. He is more than ever convinced of a connection between lines, hills and water which must have been deeply rooted in Andean lore. He has been able to follow some clues to the high Andes in the land covered by Tschiffely and Metraux, where he found yet more lines connecting mountains and places where spirits dwelt according to the ancient religion practised there. As I saw in the 'seventies, that ancient religion can draw its disciples along many straight paths.



Johan Reinhard received the prestigious Rolex Award for Enterprise, 1987, for his studies of high altitude mountain shrines.

Duncan Masson, who had been a boy apprentice on a farm in the Palpa valley, once pointed out how shells were found near the *puquios,* the subterranean water channels. And in Duncan's opinion some of the Nasca lines themselves led in the direction of water sources or irrigation channels which in turn are ancient. Thus the case for a 'water connection' lost a great ally when Duncan Masson died. He had known Maria Reiche for years and inspired many investigators with his down to earth approach. More practically, perhaps, an incalculable amount of local knowledge was lost —

Phyllis Pitluga, an American astronomer, has been working closely with Maria Reiche since 1983.

ora Honoris Causa a María Reiche

Success in 1986 when San Marcos University awarded Maria Reiche an Honorary Doctorate.

Duncan always promised to tape his work but like so many enthusiasts he never even started.

Another part of the pattern of memories, Ralph Hewins, the journalist and author, died in 1984. Maria and Renate had pinned their hopes on Ralph to write Maria's biography, but ill health and the distance to Nasca made Ralph's task impossible, so Renate began to draw together the enormous number of documents and information. Some she stored in her retirement apartment in Bavaria, the rest had to be collected from Maria's friends in Lima.

More important than the book to Renate and Maria was the need to see the research completed. 'We need someone who can understand what Maria has been trying to achieve', Renate said to me. 'Our friend Phyllis Pitluga has promised to help'. Phyllis Pitluga, an astronomer from the Adler Planetarium in Chicago, first visited Nasca on holiday with her husband in 1983. After taking the regular tourist flight over the lines she met Maria over lunch and became fascinated by the depth of her theories. Pitluga returned to her work and thought little more about the meeting until she received a letter addressed to 'The Woman Astronomer/Chicago Planetarium/USA'. Maria Reiche sensed she had found a successor. 'My predestination again. I had seen Phyllis in a dream'.

Phyllis Pitluga replied to Maria's letter and Maria, whose sight was failing, sent a tape recorded message in the form of a song she composed to the tune of 'Daisy, Daisy, give me your answer do. . .' Phyllis was entranced and in late 1983 she spent a month in Nasca.

Since then Phyllis Pitluga, with a Fulbright Scholarship, has visited Nasca each year and studied the desert, often with Maria alongside pointing out subtle features. Pitluga has turned once more to checking the lines in the figures and has asked the same burning question that Dr Hawkins put to his computer: 'Did the lines match stars on a one line one star basis — and within an acceptably short period of time?' Since the early days when she worked with Paul Kosok, Maria has said that the line through the abdomen of the spider was directed towards the constellation Orion. The three stars of Orion's belt were known to the Spanish priests as the 'three Marys' and to Andean sorcerers as special omens.

The line through the spider does go somewhere near Orion and Phyllis Pitluga now believes that several of the lines beginning near the spider and spread fan-like near it represent an attempt to keep pace with the constellation over more than five hundred years of the earth's precessional wobble. But sceptics point first to the perennial problems of dates for the alignment and then to all those lines which could not have any celestial connection.

For the future Maria relies on Renate and support from enthusiasts like Phyllis. In 1985 she fell and broke a hip which recovered well after treatment in Lima. Despite press reports of blindness she can see, though faintly, and as ever she is preoccupied with the protection of the pampa. In 1986 the country

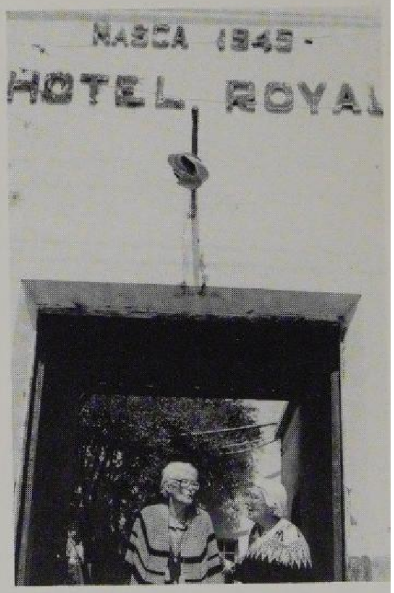
Maria and Renate Reiche.

of her destiny awarded her two honours. One, the 'Magisterial Palms', was given in the highest order possible, the order of 'Amauta' (the wise woman). Then at the end of the year she travelled to Lima with Renate to receive an Honorary Doctorate from the University of San Marcos. The press and Nasca voiced wholehearted congratulations and pride.

The *doctora* returned to her work: press interviews and daily lectures in the hotel take much of her time. Television units are booked into Maria's diary by Renate. In March 1987 *National Geographic Explorer* visited her, with photographer Marilyn Bridges, archaeologist Heleine Silverman and Phyllis Pitluga taking part. 'It was an all women event', said Renate, 'and the next will be with Canadian television'.

Spare moments are few and far between for Maria, but somehow she makes time to continue perfecting the measurement unit, remaining convinced that the answer to the mystery will be found. But she is emphatic: 'You must know the pampa and the people. Even today you will find parts of the desert where Indians will not walk. They say such places are full of evil spirits. To you and me it may be as simple as a spot where a shadow touches a track. Have you not walked down a path and avoided stepping on the lines where paving stones meet?' Maria vividly recollects where certain lines change direction in the shadow of a hill. Such places are still hallowed in parts of the Andes and are usually marked with stones. The theories of sacred pathways spawned by Toribio Mejia's discovery are not so far from Maria's own ideas.

All her years of experience have yet to be written. 'There are special places you find only when you live on the pampa. Some people here know about them, but they are very secret'. And when asked for a precise spot, Maria Reiche's face gleams with vivid memories of her solitary explorations as she leans forward to whisper: 'It's close to the... No. Wait! I'll put it in my next book'.



Marie and Renate outside the hotel where she stayed after the Second World War.

Further Reading

For the convenience of following the history of Maria Reiche and Nasca, the titles are listed in chronological order.

Nasca is commonly written with a 'z', a European form introduced by a German archaeologist in 1906. Locally and historically the 's' spelling is correct.

1949 *Mystery on the Desert,* Maria Reiche, Lima
1955 *Highway of the Sun,* Victor von Hagen, New York
1956 *Peru: Ancient Peoples and Places,* Geoffrey Bushnell, London
1957 *The Ancient Civilizations of Peru,* J Alden Mason, London and New York
1962 *The Art and Architecture of Ancient America,* George Kubler, London
1964 *Journey Through a Forgotten Empire,* Mark Howell, London
1965 *Life, Land and Water in Ancient Peru,* Paul Kosok, New York
1968 *Oasenstadte und Zaubersteine im Land der Inka,* Hans Dietrich Disselhoff, Berlin
1968 *Mystery on the Desert* (2), Maria Reiche, Stuttgart
1968 *Erinnerungen an die Zukunft,* Erich von Däniken, Dusseldorf
1970 *Beyond Stonehenge,* Gerald S Hawkins, New York
1975 *Mystery of the Ancient Nazca Lines,* Loren McIntyre, National Geographic Magazine, Washington
1977 *Les Pistes de Nazca,* Simone Waisbard, Paris
1977 *Nazca: Journey to the Sun,* Jim Woodman, New York
1978 *Pathways to the Gods,* Tony Morrison, London
1983 *Nazca: La Clé du Mystère,* Henri Stierlin, Paris
1984 *Maria Reiche and Nazca's Gods,* Clorinda Caller Iberico, Lima
1986 *The Nasca Lines* (2nd edn), Johan Reinhard, Lima
1987 *Lines to the Mountain Gods: Nazca and the Mysteries of Peru,* Evan Hadingham, New York
1987 *The Lines of Nazca,* Anthony F Aveni, Oklahoma

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Nick Asheshov, Jo Baxendale, Nilda Cacéres, Ralph Cané, Dan and Gigi Carter, Eleanor Carver, David Cole, Professor Verne Grant, Elli Griffis de Zuniga, Adriana von Hagen, Brenda Harriman, Dr Gerald S Hawkins, Norah and Harry Knapp, Josué Lancho, Sra Martha de Masson, Nicky Mügge-Bruckert, Dr Christel Rehker, Dr Johan Reinhard, Teddy Ronalds, Professor John H Rowe, Wolfgang Schüler, Deitrich Schulze, Judy Tennant, Sally Webster, Jim Woodman, Toribio Mejía Xesspe.

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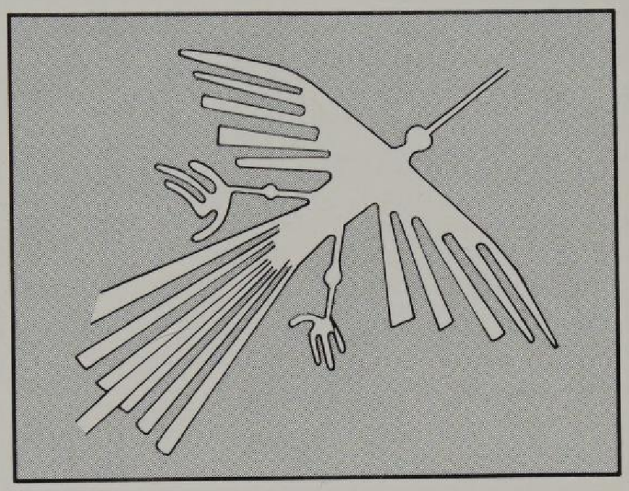

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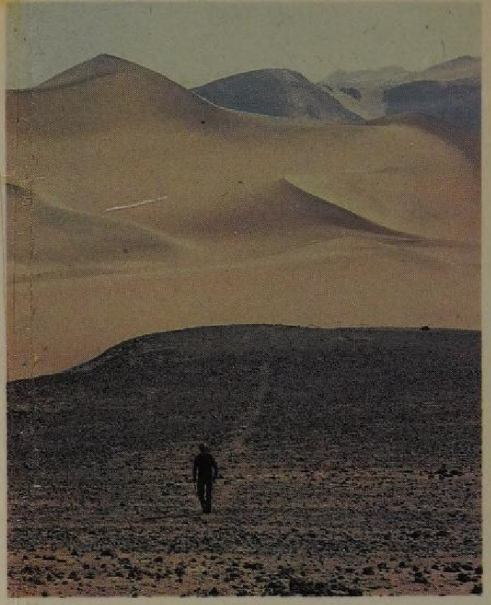
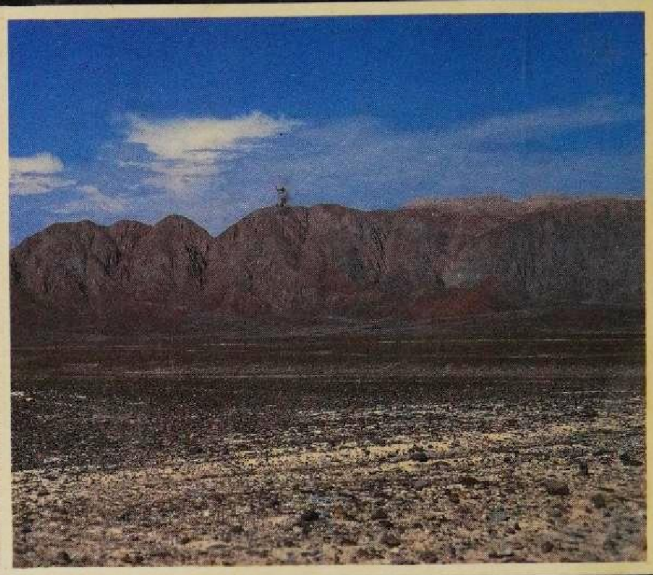
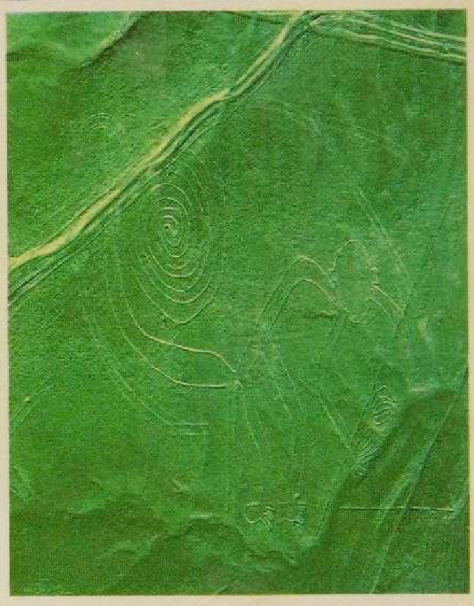
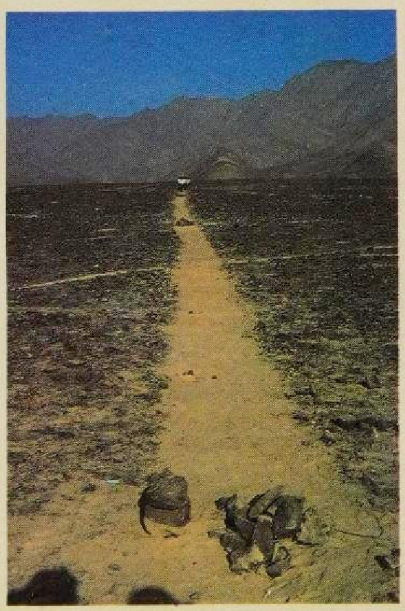
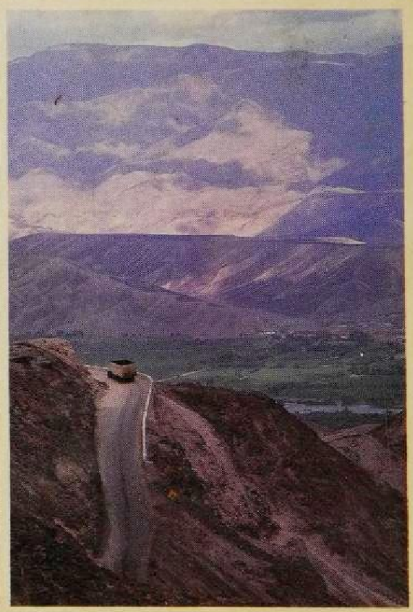


Tony Morrison is uniquely qualified to write this book having known Maria and the Nasca Lines for twenty-five years. He has produced or directed three BBC TV films on the subject: 'Mystery on the Desert' (1963), the Gerald Hawkins survey for Chronicle in 1968, and 'Pathways to the Gods', Chronicle, 1978. He appeared on Central TV's 'Mysteries of Peru' in 1986. His book *Pathways to the Gods* is a standard work on the subject. He has written for newspapers and magazines on this and related areas. He is a Fellow of the Royal Geographical Society and of the Explorers' Club, New York.



The mystery of these enormous markings across 500 square miles of the Nasca desert of Peru has never been solved



Whether ancient gods, prehistoric astronauts or human logic were responsible for their creation remains undecided